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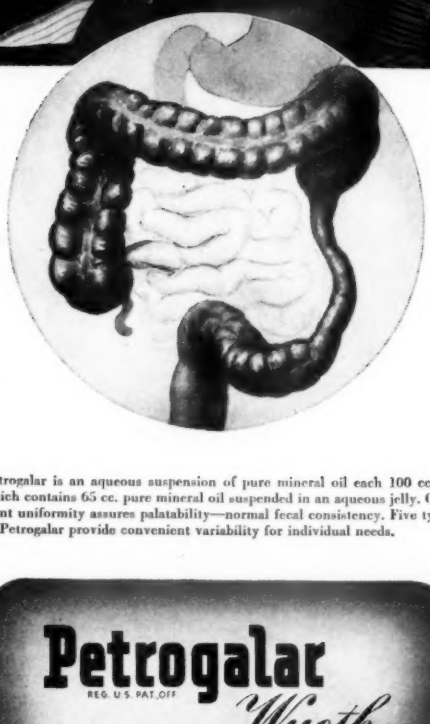

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Minnesota Medicine

Journal of the Minnesota State Medical Association, Southern Minnesota Medical Association, Northern Minnesota Medical Association, Minnesota Academy of Medicine and Minneapolis Surgical Society

Volume 27 June, 1944 Number 6

MANPOWER PROBLEMS IN THE PROFESSIONAL FIELDS

DRENG BJORNARAA

State War Manpower Director for Minnesota

Saint Paul, Minnesota

THE War Manpower Commission has two main operating arms in the field of professional occupations. These two arms are (1) the National Roster of Scientific and Specialized Personnel and (2) the Procurement and Assignment Service for physicians, dentists, veterinarians, sanitary engineers, and nurses. You are all familiar with the Procurement and Assignment Service since you have all no doubt taken part in its operations. However, the National Roster of Scientific and Specialized Personnel which, for obvious reasons, I will henceforth call the National Roster, does not touch the medical profession except in that it does include related professions such as Bacteriologists, Anatomists, Physioligists, and Biologists.

The National Roster is a division of the Bureau of Placement of the War Manpower Commission and is responsible for the recruitment, allocation and placement on a nationwide basis of scientific and specialized civilians with professional qualifications. The coöperative procedure between the National Roster and the United States Employment Service of the War Manpower Commission has been developed in order to make the facilities of the National Roster available to local employment offices in filling jobs for which the National Roster has records of qualified applicants, and to assist the National Roster in placing its facilities at the disposal of persons making application for employment to the United States Employment Service.

The coöperative procedure is applicable when the local office for instance, here in Saint Paul, receives an order for a person in a classification included in the National Roster's occupational fields. If the St. Paul office cannot find a person with the qualifications locally, the order is sent to other offices in the State, or other states, through our State Office. The moment that order reaches our State Office it is automatically referred to the National Roster for attention. The National Roster maintains a punch-card system of records for all persons registered, so, as soon as the order is received, these cards are run through machines to sort out the cards which are punched to indicate the same or similar qualifications as those indicated on the order. The qualifications, work records, and other information on persons having the correct qualifications are then mailed directly to the Saint Paul office for selection by the employer.

Similarly, when an applicant having the qualifications necessary for occupations included in the National Roster appears at a local United States Employment Service office and it appears that he cannot be placed locally in a job at which he can use his professional skill, he is then asked to submit his qualifications to the National Roster and thus be made available for job openings nationally.

I have thus far not touched on manpower problems in the professional fields but have outlined

Presented at the County Officers Meeting conducted by the Minnesota State Medical Association, Saint Paul, Minnesota, February 26, 1944.

for you the operations of one of War Manpower Commission's methods of recruiting and allocating manpower in the professional field. The fact that manpower problems and shortages exist in the professional fields is evidenced by the fact that thirty-three of the fifty-five major occupational groups in the National Roster are also on the list of Critical Occupations of the War Manpower Commission and any person in these occupations is given special consideration not only by the War Manpower Commission but also under policies of the Selective Service System.

The program of the War Manpower Commission is designed in such a way that the employment of and transfer from job to job of persons in professional fields are controlled by voluntary controls established by management-labor committees and committees made up of local professional people. As I have said before, you are all familiar with the Procurement and Assignment Service which on the national level, like the National Roster, is also in the Bureau of Placement of the War Manpower Commission. However, as you know, on the local level the Procurement and Assignment Service is made up of committees of local professional people unlike the National Roster which exists only on the national level due to the different nature of its operations and the problems involved.

The War Manpower Commission has also established local employment stabilization plans which are developed by local management-labor committees. These plans are applicable to the professional fields of occupations as well as to the trades, service and laboring groups. The employment stabilization plans, of which we have twenty-nine in Minnesota, in general provide controls over the transfer of workers from job to job in order to (1) eliminate wasteful labor turnover in essential activities, (2) reduce unnecessary labor migration, (3) direct the flow of scarce labor to places where most needed in the war program, and (4) to promote the maximum utilization of manpower resources.

The occupational groups included under the jurisdiction of the Procurement and Assignment Service are included under the provisions of employment stabilization plans in a great number of cases. The exceptions that come to my mind are those professional people who are self-employed and who wish to enter employment for someone else. Another quite large group of individuals who are not included are employes of nonfederal public institutions who are not covered unless the institution elects to be covered by the plans.

For those persons who are covered by provisions of the employment stabilization plans and who are under the jurisdiction of the Procurement and Assignment Service, special provisions have been made for implementing the hiring controls of the plans. It is recognized by the War Manpower Commission that the question of transfer of workers from one job to another in these fields can best be handled by the Procurement and Assignment Service since that service has most complete information on the best utilization of available workers in the field. The only occasion on which the War Manpower Commission acts in determining the availability of a worker for transfer is in a case where an employer refuses to comply with a request of the Procurement and Assignment Service for the release of an employe.

The War Manpower Commission in this region is cognizant of the problems encountered by public and private institutions related to the medical profession in recruiting workers of a sub-professional grade, in addition to those of a professional grade. At all times since shortages of workers began to appear, local offices of the United States Employment Service have made concerted efforts to recruit workers for hospitals and similar institutions in this State and in other states of Region VIII of the War Manpower Commission. On November 11, 1943, Mr. Rarig, our Regional Director, issued a bulletin to all offices in Minnesota, Iowa, Nebraska, and North and South Dakota instructing them to make every effort in aiding hospitals and similar public and private institutions in recruiting a sufficient number of workers to maintain their standards of service.

We have encountered some difficulties in furnishing workers at the sub-professional level due to the competition for workers of this type brought on by increased war production and varying wage rates. Hospitals are classified as an essential activity and it is imperative that their services be maintained.

Mr. Rarig, in this bulletin, recommended that state and area directors not only give all possible assistance to these institutions in obtaining additional workers, but also in helping them to retain their present workers. The matter of retaining the workers has been helped to a great extent by

the establishment of local employment stabilization plans. I am also happy to report that we have had some success in recruiting workers for hospitals and similar institutions.

I realize that I have raised many questions in your minds regarding specific provisions of the employment stabilization plans that may affect your own employes under your direction. It is extremely difficult to discuss employment stabilization in such a way that the discussion covers the whole field, due to the fact that local plans vary and also due to the fact that we are dealing with human beings and their work. In general, no two cases or problems arising out of the employment stabilization program are alike due to the human element.

I shall be happy to answer any questions on any specific problem that comes to your mind with regard to employment stabilization or its effect on your profession.

THE CLINICAL USE OF DICUMAROL

Report of Cases

EUGENE E. ECKSTAM, M.D.
Duluth, Minnesota

IN 1921 two veterinary scientists, Schofield and Roderick,[2] one in Canada and one in the United States, independently found that spoiled sweet clover or improperly cured silage was the cause of hemorrhagic disease of cattle. In 1940, Professor Link[2] of the University of Wisconsin succeeded in isolating the active principle, 3, 3'-Methylenebis (4-hydroxycoumarin), or dicoumarin.* Later he synthesized a substance which was identical to that extracted from the spoiled sweet clover.

Mode of Action

From data both on human beings and on experimental animals,[11,13,14,20-22] many of the basic actions of the drug have been described. There is a latent period of twenty-four to seventy-two hours before the prothrombin time is prolonged. Because of this it has been suggested[24] that dicumarol inhibits the formation of prothrombin in the liver, and that the prothrombin in the blood stream is reduced before the prothrombin time is prolonged. Dicumarol also delays clotting time, clot retraction time, and the red blood cell sedimentation rate. It dilates the capillaries, small arterioles, and venules. The bleeding time is not consistently affected because of the tissue factor present when skin is injured. Dicumarol does not dissolve the clot that has already formed, but it prevents that clot from extending and allows it to be organized.

Toxicity

Clinically there are no toxic effects other than bleeding. Hemorrhages may occur from the nose, lung, stomach, bowel, kidney, bladder, under the conjunctiva, and skin. Kidney and liver function tests are normal after prolonged use of dicumarol. A fresh blood transfusion, or bank blood under forty-eight hours old, is the treatment for bleeding. Vitamin K is generally believed not to have much effect on counteracting this bleeding, but all authors do not agree.[21]

Experimentally if large doses are given over a period of a couple of weeks, the animals will die of hemorrhagic manifestations. If one massive overdose is given,[22] the animals usually died within an hour of a cardiovascular collapse.

Indications

Thrombophlebitis and phlebothrombosis in medical or postoperative patients are two of the most common indications especially when the patient has had a previous episode of either. Pulmonary embolism is a definite indication since the embolus has developed from an existing thrombus. It has also been used in the treatment of thrombosis of arteriosclerosis (as in the cerebral and coronary vessels), Buerger's disease, and a few cases of involvement of the cavernous sinus, and retinal veins.

Presented at the monthly staff meeting, St. Luke's Hospital, Duluth, Minn., December, 1943.

*Dicumarol is the trade name adopted by the Wisconsin Alumni Research Association.

An illustration of the value of dicumarol in some of the above conditions is brought out in the Bulletin of the Mayo Clinic.[3] Out of ninety-

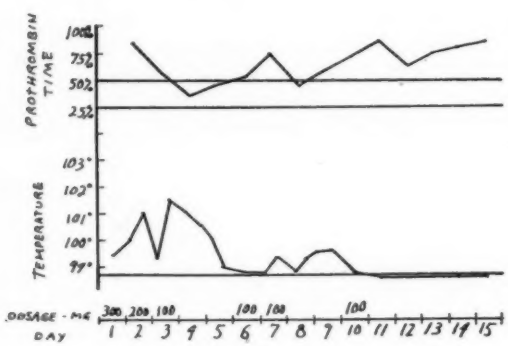

Fig. 1. Case 1.

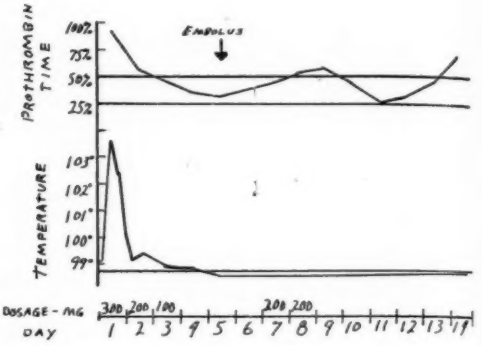

Fig. 2. Case 2.

one surgical patients, who had a postoperative pulmonary embolism or infarction, and who were treated with dicumarol, 40 were expected to have a subsequent episode. Actually only two patients did. Seventeen patients were expected to have a fatal pulmonary embolism and none of them did. Other striking figures are given for thrombophlebitis, et cetera.

Contraindications

Absolute contraindications are hemorrhagic tendencies and existing low prothrombin time, liver and kidney damage, and subacute bacterial endocarditis. Relative contraindications are the presence of ulcerative or granulating surfaces, gastric decompression tube, and pregnancy plus one week of the puerperium. Dicumarol should not be used routinely because the incidence of thrombophlebitis is less than 1 per cent, whereas the incidence of hemorrhagic manifestations due to the drug is greater.[10]

Therapy

The average patient satisfactorily responds to the following doses of dicumarol: 300 mg. the first day, 200 mg. the second day, and 0 to 200 mg. daily thereafter, depending on the prothrombin time that day. Allowance must be made for the latent period. The therapeutic level is reached when the blood prothrombin is 25 to 50 per cent of normal as measured by the prothrombin time. Dicumarol is continued until the patient is subjectively and objectively well. After stopping the drug, it takes from two to ten days for the prothrombin time to return to normal, but in cases of liver or kidney damage, or bleeding tendencies, it may take even longer. A transfusion of fresh blood is then indicated.

The following cases are selected from our series of twenty-three to date and serve to illustrate many of the points brought out in the above discussion.

Case Reports

Case 1.—Mrs. M. J., thirty-year-old housewife, had a cesarean section because of a funnel pelvis. Fourteen days later she noticed soreness, tenderness, and swelling of her left leg. The tenderness was limited to the course of the saphenous veins of the left leg, but there was no redness nor local heat. The vessels were easily palpated. The diagnosis was phlebothrombosis, and dicumarol was started along with general treatment consisting of elevation, immobilization, hot packs, and sulfadiazine. After six days the leg was non-tender and the patient had no complaints. Since a small amount of fever persisted, dicumarol was again given, and the patient was discharged as cured after fifteen days in the hospital.

Case 2.—Mr. B. M., thirty-eight-year-old laborer, had an interval appendectomy. Postoperatively, he had abdominal distention and was treated with continuous gastric decompression and parenteral fluids. Five days postoperatively, he developed a thrombophlebitis in his left thigh at the site of a hypodermoclysis injection. Dicumarol and sulfamerazine were started and the temperature dropped rapidly (see graph). Four days later the patient had the signs and symptoms of a pulmonary embolus in his left lung. He was treated with papaverine intravenously, morphine sulfate by hypo, and nasal oxygen. Chest x-ray supported the diagnosis. Dicumarol was continued and the patient recovered well enough to be discharged on his 19th hospital day.

Comment.—Pulmonary emboli have been known to occur under the administration of dicumarol, but it is not common.

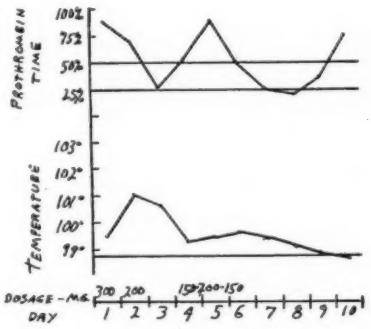

Fig. 3. Case 3.

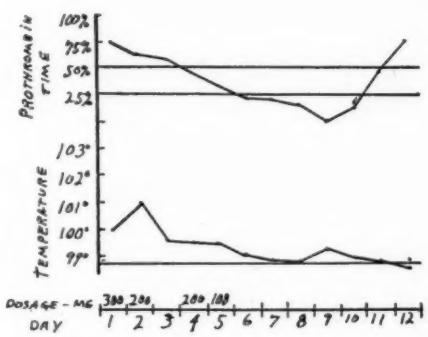

Fig. 4. Case 4.

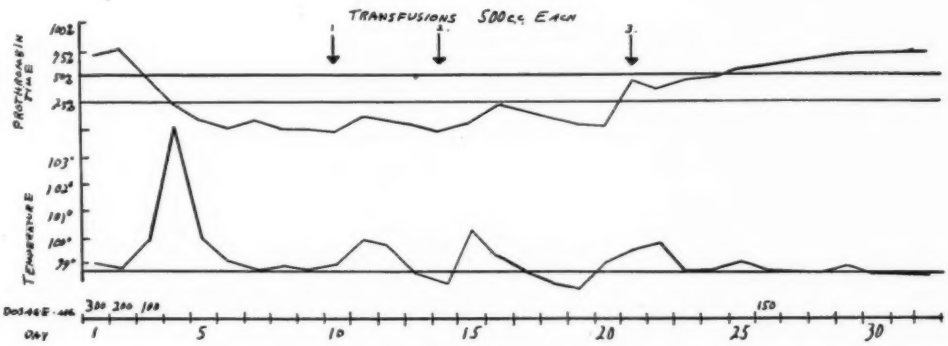

Fig. 5. Case 5.

Case 3.—Mrs. J. L., thirty-year-old housewife, was admitted to the hospital complaining of abdominal pain. She was found to have a right lower lobar pneumonia and was treated with sulfadiazine. She developed a small amount of pleural effusion which clearned spontaneously. On her fourteenth hospital day the patient developed a thrombophlebitis in her right leg, and she was started on dicumarol. The thrombophlebitis showed no appreciable response until the prothrombin time was near 25 per cent, after which it rapidly improved. The patient was discharged on her twenty-fourth hospital day.

Comment.—We have noted in many of our more severe cases that blood prothrombin must be reduced from 25 to 30 per cent of normal as indicated by the prothrombin time before there is a clinical response. Other cases respond well to levels around 50 per cent of normal.

Case 4.—Mr. S. O., forty-eight-year-old veteran, had a cholecystectomy and appendectomy in another city. Two weeks later he noticed a sudden, sharp pain in his right chest, dyspnea and apprehension, as he was arising from a supine position. A day later he was admitted to the hospital where a diagnosis of pulmonary embolism was made. He was started on dicumarol and general supportive therapy. The patient improved gradually but developed and retained pleuritic pain in his right posterior chest. Dicumarol was continued five days, but the prothrombin time went down to 4 per cent of normal (see graph). Even with this dangerously low level the patient showed no hemorrhagic tendencies. Unfortunately, the patient later developed an encapsulated pleural effusion at the site of the infarct. This was aspirated, and he gradually improved.

Case 5.—Mr. J. K. was a sixty-seven-year-old farmer. Diagnosis on admission was benign prostatic hypertrophy, mild diabetes mellitus, and auricular fibrillation. He was submitted to a transurethral prostatic resection. On his fourteenth postoperative day he complained of sudden severe pain in right foot, which became pale, cyanotic, and cold. Dorsalis pedis pulse on his right foot was absent; that on the left was full and bounding. Diagnosis of arterial embolism from an auricular thrombus was made and dicumarol was started along with

intravenous papaverine, heat and elevation of the leg. At this time examination of the heart showed frequent extrasystoles but no auricular fibrillation. Three days later, the patient complained of pain in his right chest, left renal area and vague abdominal pains. These were interpreted to be multiple embolic phenomena with involvement of the lungs and parenchymatous organs. In addition the patient developed a left pyelonephritis. The auricular fibrillation returned and digitalis was started. The condition of the foot improved somewhat.

After the first three days of dicumarol administration, the prothrombin time dropped to 1 per cent of normal (see graph). Three fresh blood transfusions of 500 c.c. each were given with increasingly better responses of the prothrombin time. Vitamin K (Hykinone) was given three times daily starting with the third transfusion. The prothrombin time then gradually rose to 70 per cent.

During the periods when the prothrombin times were at their lowest percentage, the patient had moderate to severe hematuria. This stopped only after the third transfusion.

The great toe of the right foot developed a dry gangrene, and the patient was transferred to a veterans' hospital after his fifty-first hospital day.

Comment.—In retrospect, this patient was aged and somewhat debilitated and should not have had the standard dosage. Digitalis should have been started upon admission. It appears as if Vitamin K had a beneficial effect in this case. 150 mg. of dicumarol was given on his twenty-sixth dicumarol day by mistake, but it had no effect on the prothrombin time.

Summary

Dicumarol prevents extension of intravascular thromboses and aids in the recovery of thrombophlebitis, phlebothrombosis, and pulmonary embolism. Actions, indications, and contraindications are discussed and five illustrative cases are presented. Dicumarol is a valuable drug, but it must be used with caution. Patients must be in hospitals where daily prothrombin times can be run.

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Tuberculosis, syphilis, cancer, heart disease, and other killers of mankind show no signs whatsoever of adopting a forty-hour week; instead, there is every reason to believe that unless society continues to press its fight against them with undiminished vigor we may shortly see an upsurge in their incidence as we did during and following World War I.—E. E. KLEINSCHMIDT, M.D., *Ohio State M. J.*, March, 1944.

HAND INFECTIONS

R. F. HEDIN, M.D., F.A.C.S.

Red Wing, Minnesota

FEW conditions contribute more to the manpower loss in industry than infections of the hand. Seemingly trivial injuries often become infected, resulting in painful, disabling deformities for the employe and great economic loss for the employer. Because of the fine, coördinated movements of the hand, involving muscles, tendons, bones, joints, nerves and blood vessels, the preservation of function is of paramount importance. Neglected or carelessly treated cases invariably result in loss of time and often in loss of function. On the other hand, few infections respond so well to early, accurate treatment. Such treatment cannot be administered without a precise knowledge of the anatomy of the hand, and the definite routes through which infections spread. It would seem timely, therefore, to re-

Read before the Saint Paul Surgical Society, January 13, 1944.

emphasize the surgical principles and surgical anatomy stressed in the authoritative work of Kanavel, Koch, Mason and Allen.

General Care

1. *Avoid Further Injury.*—Care should be taken not to injure further structures which have already been traumatized. In this regard, sharp, well-placed, purposeful incisions are essential. Moreover, the use of the brilliantly colored antiseptics, which destroy cells as well as bacteria, should be replaced by gentle mechanical cleansing of the part with white soap and water.

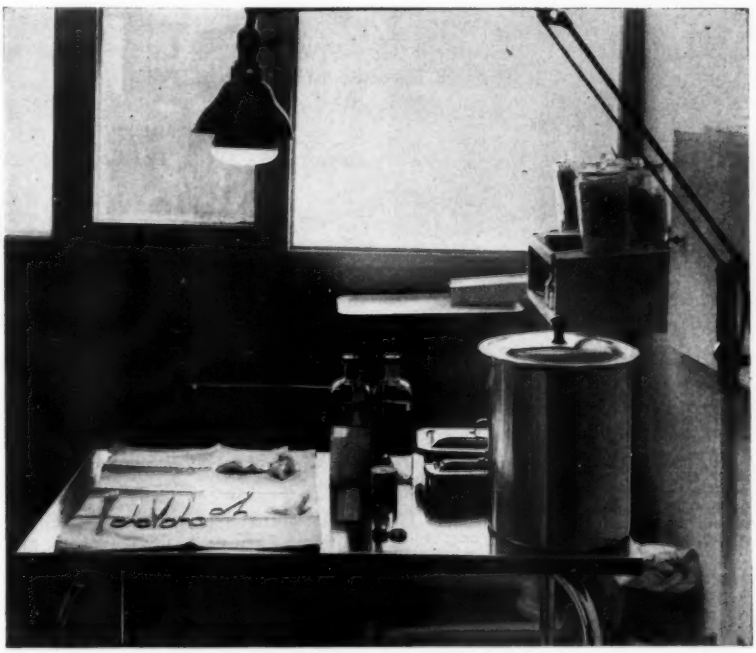

Fig. 1. Simplified dressing setup, consisting of a sterile towel on which are placed forceps, scissors, cotton balls (which are soaked in white soap and water), fine mesh gauze, ordinary gauze and applicators. Note the absence of the various brilliantly colored antiseptics.

2. *Avoid Reinfection.*—Too often injuries and infections of the hand are relegated to office or dispensary procedures, where proper surgical surroundings are lacking, inadequate instruments are used (Fig. 1), no provision is made for

masking the nose and mouth and thus the wounds become reinfected. When symbiosis occurs, a minor infection may become a major one with deleterious results.

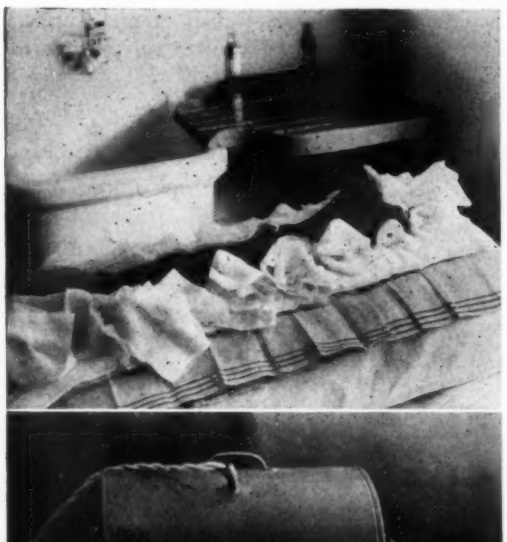

Fig. 2 *a (above)* Large, warm, moist, sterile dressing. Sterile towels are placed so as to extend from the axilla to below the finger tips. Abdominal pads and fluff dressings are used to encircle the extremity. Fingers are separated by gauze to prevent maceration of skin. A sterile roller bandage placed in the palm holds the hand in the position of function. *b (below)* Warm, sterile saline is used to moisten the dressing. Care should be taken not to soak the dressing so that maceration and edema result. The entire dressing is elevated on a pillow and a light cradle, with sufficient light bulbs to keep the temperature constant, is placed over it.

3. *Adequate Drainage.*—Early adequate drainage should be carried out with the least possible trauma to the delicate structures of the hand. In order to achieve this it is necessary to visualize clearly the path of the infection. This means that troublesome bleeding must be eliminated. A bloodless field is obtained by placing securely a blood pressure cuff on the arm and, after elevating the hand, raising the pressure in the cuff to 250 mm. of Hg. A general anesthesia is essential in order that the patient may withstand the pressure from the inflated cuff.

4. *Avoid Rigid Drainage Material.*—Rigid drainage material puts undue pressure on the delicate tissues of the hand, causes necrosis and therefore should not be used. Soft rubber tissue or vaseline gauze inserted into the angle of the wound for a period of twenty-four to forty-eight hours usually gives efficient drainage without damage to structures in the hand.

5. *Sterile Dressings.*—When dressings are made in the office, sterile instruments should be used. If moist dressings are employed to provide drainage for an infected surface, the patient should be cautioned not to moisten the dressing at home, since by so doing, without knowledge of asepsis, he can easily reinfect the wound.

For infections of the hand where hospitalization is necessary, a *large, warm, moist, sterile* dressing (Fig. 2a) has been found useful. Sterile towels are spread out so as to extend from the axilla to well beyond the finger tips. "Abd" pads are then placed on the towel to form a trough, and fluff dressings are placed on the pads so that the arm, forearm and hand are completely encased. Dressings put between the fingers will prevent maceration of the skin which occurs when skin surfaces touch. The dressing is then moistened (not soaked) with sterile, warm saline. After a layer of "abd" pads has been put over the fluffs, the towel edges are snugly fastened together with safety pins. The elevation of the forearm and hand by a pillow will prevent edema and provide dependent drainage. The dressing is kept warm by electric light bulbs in a cradle (Fig. 2b), the number of bulbs being adjusted to give the desired temperature. The entire cradle is covered with a blanket. Such a dressing is usually opened only every twelve to twenty-four hours to moisten with warm, sterile saline and to replace soiled dressings. Because of the relatively few times it is opened, the possibility of reinfection is minimized. A uniform temperature is maintained in contrast to the extreme variations when the usual hospital "hot pack wringing out" ritual is used.

6. *Purposeful Splinting.*—Splinting hastens healing since it prohibits movement of the part and thereby protects against tearing of delicate granu-

lation tissue. Moreover, by minimizing muscular movements, it prevents spread of infection through vascular and lymphatic channels. The use of a simple wooden tongue blade often provides sufficient splint for a finger. When a more extensive infection of the hand is present, a metal splint can be quickly made which will hold the hand at rest and in position of function. This position is important, for, if infection should result in extensive fibrosis of tendons, the hand will still be useful in carrying out many of its common functions (Fig. 3).

7. *Care of Granulation Tissue.*—It should be remembered that granulation tissue plays a major role in the reparative processes of trauma and infection. Every attempt should be made to preserve these vascular structures. Exuberant granulations can be dealt with by means of a firm pressure dressing, which will flatten them. Cauterization with silver nitrate should be avoided, since it will open up to infection the small vessels in the granulations. Necrotic tissue is best separated by dressings moistened with freshly made Dakin's solution. All granulating surfaces should be covered with sterile *fine-meshed gauze* so that bleeding does not occur when subsequent dressings are made. It should also be remembered that moist dressings promote drainage and do not allow crusting of exudate, with resultant pooling of pus, to occur.

8. *Route of the Lymphatics.*—In dealing with infections of the hand, it is important to remember Kanavel's Law—"the lymphatics from the palmar surface of the hand form a complex network which drains into collecting trunks which *pass by the shortest route to the dorsum of the hand.*"

Lymphangitis resulting from infection of the various fingers has very definite routes of spread. Lymphatics from the little and ring finger travel up the ulnar side of the forearm to end in the epitrochlear nodes. The lymphatics of the middle finger end in the axillary nodes in 85 per cent of the cases and in the remaining 15 per cent in the subclavian nodes. The lymphatics from the index finger and thumb extend along the radial side of the forearm and terminate in the axillary nodes.

Hand infections are conveniently classified into minor and major infections.

Minor Infections

1. *Felon.*—A felon is an infection within the closed space of the volar pad on the distal phalanx of the finger. It usually is the result of a

Fig. 3. Position of function. (From Kanavel and Mason, The Cyclopedia of Medicine, F. H. Davis Company.)

puncture wound. Because of the peculiar compartmentation here, caused by vertical fibers extending from the skin to the periosteum, the spread of pus is impossible. Symptoms of throbbing, redness and tenseness soon appear. As the pressure increases, the small digital artery becomes compressed and necrosis or even osteomyelitis of the distal phalanx may result.

To drain adequately the septæ made by the above-mentioned fibers, an *early* incision on one side of the distal phalanx should be made so as to cut *all* of the fibers. Prompt healing usually ensues. This incision is preferred to the "fish-mouth" incision, which results in a scar that impairs tactile sensation so vital in the fingers.

2. *Paronychia.*—These infections usually result from an avulsed hangnail or from injudicious manicuring of the nails. Infection forms at the edge of the nail in a small sulcus and extends under the eponychium. If treatment is not prompt, the infection finds the path of least resistance and traverses under the nail bed, forming the characteristic, crescent-shaped, inflamed "run-around." Redness, swelling and painful throbbing quickly develop. Incisions are made on both sides of the base of the nail and the eponychium is lifted from the nail bed. With a scissors the nail bed and the proximal portion of

the nail are removed. The distal or uninvolved portion of the nail, which should be left for protection, will gradually separate off with the coming of the new nail. A small piece of vaseline gauze is placed under the elevated eponychium and a large, warm, moist, sterile dressing is applied for twenty-four to forty-eight hours. Rapid healing follows this type of treatment.

3. *Subungual Abscess* may develop when a splinter has lodged under the nail. The excision of a V-shaped portion of the nail overlying the sliver will remove it and provide drainage for a potentially infected wound. A moist dressing for twenty-four hours is ordinarily necessary.

4. *Subungual Hematoma.*—When a hematoma occurs in a traumatized finger, separating the nail from the nail bed, there is usually considerable pain. The customary "drilling" of the nail to allow for the escape of blood should *not* be done. Too oo organisms introduced at the time of drilling find a welcome medium of blood in which to grow, the "drill" hole seals over and infection follows. Instead, the side of the nail should be lifted up to evacuate the blood and a moist dressing provided.

5. *Indelible Pencil Injuries.*—A puncture wound from an indelible pencil often results in a serious infection. The aniline dye, usually methyl violet, causes a chemical reaction. The dye, being alkaline, reacts on the nucleic acid of the cells, causing necrosis often with toxic symptoms. Wide excision with care being taken to remove all of the dye-stained tissue is the method of choice in dealing with such an infection.

6. *Subcuticular Infections.*—These often result when organisms are introduced under the thickened epidermis of the palm by a puncture wound. Pain, redness and swelling quickly follow and the thickened epidermis is undermined by pus. Early removal of the overlying thickened epidermis followed by a moist dressing affords prompt relief.

7. *Hair Follicle Infections.*—These occur over the dorsum of the hand and proximal phalanges. Such infections are not unlike furuncles and carbuncles elsewhere on the body except that there usually is more swelling present due to the loose integument over these areas. If early, adequate drainage is not instituted, the infection may spread into the subcutaneous and subaponeurotic spaces and cause irreparable necrosis to the relatively avascular extensor tendons. As soon as possible after localization has occurred, a crucial incision should be made and the flaps undercut until normal tissue is encountered. After the removal of the necrotic tissue the flaps are held apart by loosely packed vaseline gauze and a moist, sterile dressing is applied. Twenty-four hours later the vaseline gauze is removed, allowing the flaps to fall inwards so as to obliterate the space. Early improvement can be expected from this type of treatment.

8. *Collar-button Abscess (Frog Felon).*—This infection usually arises when organisms enter through a fissure in a firm callus near the metacarpal-phalangeal joint in the palm. When the fissure closes over, infection spreads through the less firm dermis and palmar fascia, and quickly invades the tissue in the web of the fingers and dorsum of the hand. Swelling of the web, with the characteristic separation of the fingers, soon occurs, and unless early adequate drainage is carried out, a diffuse cellulitis in the dorsum of the hand rapidly follows. With the aid of a bloodless field, an incision distal to and parallel with the distal flexion crease will avoid digital nerves and vessels and accomplish adequate drainage. Although with this type of infection there may be extreme swelling on the dorsum of the hand, this should not lead one to make ill-advised, needless incisions in this location. A soft vaseline gauze is placed in the angle of the wound and a large, warm, moist, sterile dressing applied to the extremity. At the end of twenty-four to forty-eight hours, upon removal of the gauze drain, the infection should show the results of timely, competent treatment.

Major Infections

Under this heading we are concerned with infections of the digital tendon sheaths, the bursæ, and involvement of the deep fascial spaces of the hand. An understanding of the anatomy and the potential routes of spread of infection between the sheaths, spaces and bursæ is essential to establish accurate treatment. To deal with such infections successfully without injury to the vital, complex structures of the hand is, indeed, a major surgical procedure.

Anatomical Peculiarities.—The *tendon sheaths* in the palmar side of the hand are smooth, glistening, synovial membranes containing a small amount of synovial fluid which facilitates the smooth gliding action of the flexor tendons of the fingers and thumb. They are in close proximity to, and often continuous with, the ulnar and radial bursæ and the thenar and middle palmar spaces (Fig. 4).

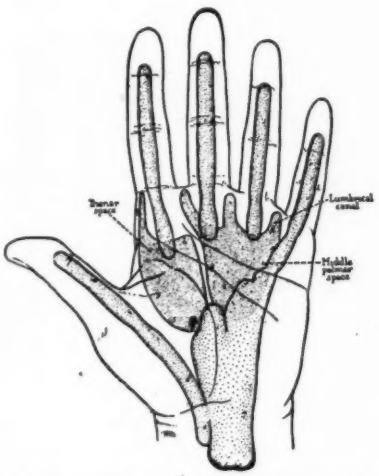

Fig. 4. The routes of extension from tenosynovitis. (From Kanavel and Mason, The Cyclopedia of Medicine, F. H. Davis Company.)

The tendon sheaths of the *index, middle* and *ring* fingers extend from a point just distal to the distal interphalangeal joint to a point just proximal to the metacarpal-phalangeal joint. The proximal ends of the sheaths are so arranged that when the sheaths become distended with pus, the proximal end becomes incompetent and pus escapes into the deep fascial spaces of the hand, i.e., the thenar and middle palmar spaces. The thenar space lies deep on the radial side of the hand, while the middle palmar space is deeply situated on the ulnar side. (The fascial band extending from the middle metacarpal bone arbitrarily divides the hand into the radial and ulnar halves.) The tendon sheaths of the index finger lies in close relationship or communicates with the thenar palmar space; the tendon sheath of the ring finger with the middle palmar space, while the tendon sheath of the middle finger may communicate with either the thenar or middle palmar space, or both.

The tenden sheath of the *little finger* becomes continuous with the *ulnar bursa.* This is a rather large bursal sac which courses proximally on the ulnar side of the hand under the hypothenar muscles and volar carpal ligament, to end about 4 cm. above the wrist. It encases all of the flexor tendons except the long flexor to the thumb. The tendon sheath of the *thumb* extends proximally into the *radial bursa,* which lies under the thenar muscles and volar carpal ligament and contains the tendon of the flexor pollicis longus. The radial bursa in a high percentage of cases communicates with the ulnar bursa. Because of this close relationship, infection of the thumb quickly extends so as to involve the little finger and *vice versa.*

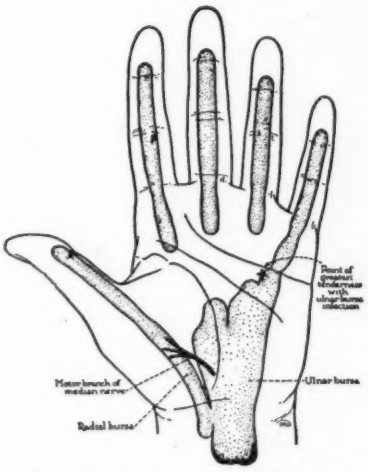

Fig. 5. This shows the usual arrangement of the ulnar and radial bursæ. Because of this communication, extension of infection often takes place between the bursæ. When neglected, further extension will involve the fascial spaces of the forearm. (From Kanavel and Mason, The Cyclopedia of Medicine, F. A. Davis Company.)

Tenosynovitis.—When organisms enter the tendon sheaths, the infection for a short time is limited to the confines of the sheath; but when the tendon sheath becomes overdistended with pus, the proximal constricting portion at the level of the metacarpal-phalangeal joint gives away, allowing the infection to spread through the respective routes mentioned above.

Tenosynovitis is often difficult to diagnose. However, four cardinal symptoms are usually present:

1.) There is uniform swelling of the *entire* finger.
2.) The finger is held rigidly in partial flexion.
3.) Extreme pain is present on attempting to extend the finger.
4.) There is excruciating pain when pressure is made over the tendon sheath.

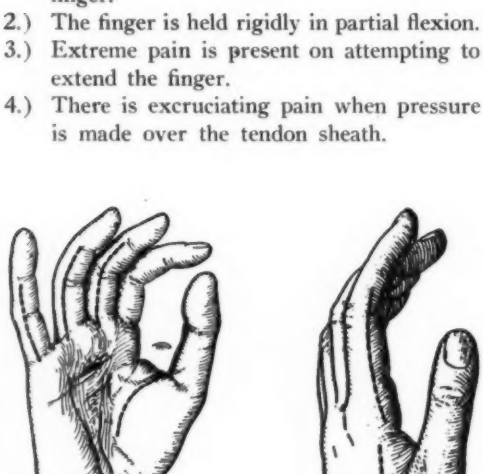

Fig. 6. These accurately placed incisions have been found to drain adequately the tendon sheaths, lumbrical canals, middle palmar space, thenar space, radial and ulnar bursæ, and space of forearm. A bloodless field minimizes trauma to vital structures. (From Kanavel and Mason, The Cyclopedia of Medicine, F. A. Davis Company.)

An evaluation of *all four* symptoms should be made in ascertaining whether or not tenosynovitis is present.

Thenar Space Infection.—When this space becomes infected, either by a puncture wound directly into the space or, more commonly, from extension of tenosynovitis of the index finger or middle finger (less common), there is swelling in the web between the index finger and thumb. The thumb is pushed out in abduction and is held in partial flexion. The area is red, warm and tense. There is usually some swelling along the radial side of the index finger, as the lumbrical canal in this area is frequently involved also.

Middle Palmar Space Infection.—This most commonly occurs from the extension of tenosynovitis of the middle and ring fingers. Infection in this space, since it lies deep in the hand under the dense palmar fascia, does not cause much swelling. There is, however, a loss of the concavity of the palm. Pain and a feeling of tenseness and puffiness over the space are usually experienced. Associated involvement of the lumbrical spaces between all of the fingers, with accompanying redness and tenderness, is commonly found.

Ulnar and Radial Bursitis.—When infection progresses from tenosynovitis of the little finger, the ulnar bursa becomes distended. There is some tenderness along the entire sac, but over the fourth metacarpal bone just proximal to the distal flexion crease, where the bursa comes nearest the surface of the palm, is the point of greatest tenderness (Kanavel's point). Infection of the ulnar bursa almost invariably involves the radial bursa (Fig. 5), as well as the tendon sheath of the thumb. Because of the close interrelationship between these two bursæ at the wrist, involvement of one should immediately bring to mind the possibility of infection in the other. When the radial bursa is infected, the thumb is held in partial flexion and there is tenderness over the tendon sheath and thenar muscles. It should be understood that when the sheath and bursa containing the flexor pollicis longus tendon become involved first, the infection spreads in reverse order, finally ending with involvement of the ulnar bursa and tendon sheath of the little finger. If early drainage of these distended bursæ is not instituted, rupture may occur into the fascial spaces in the forearm, with aggravation of symptoms.

Treatment

As early as possible adequate drainage should be carried out by accurately placed incisions (Fig. 6) made under a general anesthesia and with the benefit of a bloodless field.

In the case of *tenosynovitis* of the fingers, the incision should be on the ulnar side of the digit (excepting the index finger), so as to facilitate subsequent dressings and give simultaneous drainage to the lumbrical canals. The incision should be on the radial side of the index finger so that it can be easily extended, should the thenar space and lumbrical canal be involved. These incisions should be made just volar to the digital nerves and arteries. When in doubt, it is better to open a tendon sheath, even though it may prove to have been unnecessary. Procrastination or neglect all too often result in widespread infection and necrosis of tendons.

The *thenar space* is gained by making an incision on the radial side and slightly volarwards to the second metacarpal. The *middle palmar space* is opened by a transverse incision that is just distal to the flexion crease. The center of the incision is approximately midway between the third and fourth metacarpal bones.

When the *radial bursa* becomes distended from extension of tenosynovitis of the thumb, the tendon sheath is first drained by an incision on the ulnar side of the thumb; then the incision, beginning at the metacarpal-phalangeal joint of the thumb is extended over the thenar eminence. Care should be taken not to injure the motor branch of the median nerve, which innervates the muscles of the thenar group.

Two incisions are necessary to provide adequate drainage for the *ulnar bursa*. The distal incision is made over the fifth metacarpal and parallel to the hypothenar eminence. The second incision on the ulnar side of the wrist should start at the level of the styloid process of the ulna and should be about 10 cm. in length. Access to this proximal portion of the bursa is gained by entering between the pronator quadratus muscle and the deep flexor tendons. Seldom is it necessary to have through-and-through drainage, as an adequate ulnar incision usually suffices. In making this incision care should be taken not to injure the ulnar nerve and artery.

When the above-mentioned incisions have been made, vaseline gauze is placed in the angle of the incisions to keep them from sealing over. In these major infections of the hand, a large, warm, moist, sterile dressing is applied with the hand placed in the *position of function*. This position im maintained by placing a sterile roll of bandage in the palm of the hand or by putting the hand in an aluminum splint which has been previously autoclaved.

Supportive treatment of rest, nourishing foods, sedation, sulfonamides and blood transfusions will all be found of value in these severe hand infections.

Summary

Even a minor injury to the hand may become infected and impair or destroy the usefulness of this delicately coördinated mechanism. It is ever a serious matter and is of especial importance in relation to the present manpower shortage. Therefore, the author has attempted to review the principles, formulated by Kanavel, Koch, Mason and Allen, involved in the diagnosis and treatment of hand infections.

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The prevention of disease and the prevention of war are today the two great world problems. The way is pretty plain in this matter of war, be it against a pathogenic microbe or against a pathologic nation of people. As we have organized preventive medicine, we must organize preventive war. In medicine we do not talk about peace with the disease, with the parasites, with the tubercle bacillus, for example. We do not propose to write a peace treaty with these causes of disease. We do not sit around a peace table with our disease-producing enemies. We wage continuously either an active or preventive war. We should have a continuous preventive war program fashioned along the lines of our continuous preventive disease program. —David John Davis, M.D., *Diplomate*, January, 1944.

THE CRIPPLED APPENDIX—A PEDIATRIC PROBLEM

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MEDICINE is a field in which intelligently interpreted "feelings" still have a place in the progress toward truth in spite of the modern interpolation of the "scientific method" as a standard of its advance. It is under the banner of those to whom this conception seems reasonable that I dare present to this group a clinical impression of the magnitude involved without supporting it by a vast array of facts and figures. To them it will be evident that the individual observations leading to the impressions that are expressed, while they have not been recorded, are probably not inconsiderate over a period of more than twenty years. And to them it will be evident that whatever shall be offered as solemn opinion will be offered, not as final, but as a starting point for argument which might, in the resulting interchange of ideas, lead off on paths to greater accuracy. To them I need make no apology—to others I make no more.

By the term "crippled appendix" I mean one with such physical structure that the normally free continuity between its lumen and that of the cecum is impaired. The encroachment may occur at any point along its entire extent and may result from any of the many causes of kinks, constrictions, et cetera, which so frequently affect this organ, or from abnormal accumulations within. (It seems almost axiomatic that such accumulations should be secondary, however.) Usually, in infancy and early childhood at least, the impairments will be of congenital origin, but as age advances the possibility of adhesions from previous inflammatory reactions assumes increasing importance. The inflamed appendix, as such, is excluded except in so far as it may be coincidental to a predisposing structural pathology.

Johnny was a boy of almost any age. He had always been essentially well (or he might not have been). He had had the usual run of contagious diseases (or maybe he had not) and had not suffered too much from any (or maybe he had). He had (or maybe he had not) had his tonsils and adenoids removed some time earlier because of many "colds" and this operation had (or had not) seemed to accomplish the desired effect. At any rate everyone concerned thought that he was better for a time (or maybe they had not). Johnny was any child, male or female, who was running the hurdles of growing up.

Johnny had, however, in his composite make-up, one peculiar characteristic which gained him access to rather a select company as he went along. He possessed a gastro-intestinal tract that had a flare for making its presence known. Any disability, regardless where it was focused, seemed a signal for it to go into action either in the form of vomiting, or diarrhea, or vague pains of variable character, all of which served to muddle the clinical picture for parents and physician alike. Never did it clarify. Even between definite illnesses Johnny often complained of phantom-like pangs which could never be explained, or he couldn't eat more than a mouthful because of a feeling of fullness. His physician said it was a spastic bowel, having felt a rope-like colon on many an occasion, but his parents thought a cathartic or an enema should correct matters. Some of his vomiting attacks had proceeded to a critical state where removal to a hospital was considered. Gradually his physician and his parents, who had been through this thing in a loose way together many times before, had become complacently aware that Johnny had a "weak" stomach and was apt to vomit or have abdominal complaints whenever otherwise upset. They had passed it off on many occasions as "intestinal or stomach flu." He seemed subject to that. Then—something happened to Johnny.

He had had a slight cold, or such his mother imagined, and started with his usual abdominal difficulties. Nothing seemed different and the customary remedies were applied, perhaps with the telephonic advice of the physician. Nobody paid much attention until it finally dawned that this spell seemed a little different from those before. The boy was beginning to develop fever and he would no longer walk to the bathroom

Read before the Northwest Pediatric Society at Bayport, Minnesota, October 1, 1943.

because it hurt to stand up. The mother was alarmed when she found what misery she caused in rubbing Johnny's abdomen, a procedure always welcomed before. When the physician arrived the urgency was immediately evident to him and he either did or did not get the appendix out in time to avert catastrophe.

At operation the surgeon found an appendix grossly abnormal in its anatomical structure—being excessively long and consequently twisted, or bound down by adhesions, or hampered in whatever might be its functional activity by peritoneal bands, mesenteric folds, a retrocecal position, et cetera, and probably plugged at some point proximal to the inflamed or perforated area by a fecalith or other obstruction.

Johnny, up to the time of a subtle and not easily recognized turning point in this last illness, had been one of the most annoying types of cases with which the pediatrician has to deal, annoying but not serious. Cyclic vomiting, spastic bowel with its constipation or diarrhea (or both), unexplained nausea with or without vomiting, inability to eat more than a mouthful before feeling "full"; such common so-called functional disturbances of children were all in the picture. But from the time that that almost indiscernible variation from the usual progress of events occurred, Johnny became one of the most seriously critical types for the surgeon. His further course does not concern this paper, except, perhaps, to point out that if he got well he probably was essentially relieved of his gastro-intestinal complaints.

In case it seems to some that the picture of Johnny is too precisely drawn, let's look at a few case reports.

Case 1.—The patient, a girl of twelve, has been under my care for the last nine years.

Predominating complaints have been gastro-intestinal, consisting of attacks of pain, either with or without nausea and vomiting, occurring either with or without other evidence of disease. Fever, if present, has never been attributable to the gastro-intestinal complaint.

Physical findings referable to the abdomen have been confined to a somewhat tender rope-like sigmoid or descending colon except on one occasion when definite tenderness was demonstrable over the appendix. The mother was properly warned.

The present attack started in the usual manner. After eighteen hours the mother recognized beginning fever and tenderness in the right lower quadrant. The appendix was removed two hours later. Its base showed a marked constriction, either congenital or at least of long standing, while the portion immediately distal was dangerously distended, inflamed, and covered with exudate. The tip appeared relatively innocuous. Within the distended portion disintegrating fecaliths and pus were found. Microscopically the acute infection extended through the entire wall onto the serosal surface.

Case 2.—This patient, a girl of seven, has been under my care since eighteen months of age.

Predominating complaints have been respiratory, centering around a nasal sinusitis and its complications but the predominating worry has been in the accompanying abdominal complaints. They were—stomach ache before breakfast, in the middle of the meal, between meals, in the middle of the night, associated with constipation or diarrhea. Often she could eat but a few mouthfuls before feeling "full." All of these symptoms might come on without other evidence of disease.

Physical findings referable to the abdomen were limited to a rope-like descending colon or sigmoid, which was tender if sufficiently prodded. In spite of the absence of symptoms referable definitely to the appendix the mother was warned.

On the occasion of her final attack she awakened in the morning with a not unusual abdominal discomfort. It was not severe and she even went to school in the afternoon. She was, however, content to lie around after coming home. Early in the evening the mother recognized beginning tenderness in the region of the appendix and I was called. Upon confirming this observation—the first time appendiceal tenderness had ever been demonstrated—and finding that the patient's temperature was beginning to rise I sent her to the hospital for immediate appendectomy.

The appendix was found to be almost entirely retrocecal with a small portion of the tip protruding. This was mildly inflamed.

Case 3.—This patient, is a boy, nine and one-half years old, who has been under my care since birth.

Predominating complaints consisted of nasal sinusitis and its complications but the predominating worry was the abdominal symptoms which always accompanied other illnesses. These consisted of protracted nausea and vomiting, and abdominal pain of variable character. Over the period of the last year tenderness over the appendix had been demonstrable after, and even between, attacks.

The parents were warned of the possibilities and they decided to have the appendix removed. It was not inflamed but was long, and much twisted upon itself. The patient has not had a single abdominal complaint in the five years since the operation.

Case 4.—This patient, a girl, seven and one-half years old, has been under my care for five years.

Predominating complaints had been respiratory infections but the greatest worry was the vomiting attacks,

accompanied by abdominal pain of indefinite character which complicated every illness of whatever kind. Often they overshadowed the primary illness, such as an acute sore throat, measles, etc.

Physical findings referable to the abdomen were always negative until one time when I was called toward the end of a typical spell. I found the patient to be mildly tender over the appendix. The parents were warned.

Seven months later an "interval" appendix was removed. It was not inflamed but was constricted at its base as though tied by a suture. The pathologist found slight gross and microscopic evidence of inflammation and in addition the cross-section of a pin-worm within its lumen.

The patient has not had a single abdominal complaint in the two years since the appendectomy.

If time permitted the four cases cited could be augmented by many more, each reëmphasizing and further illustrating the fundamental contentions. For instance there is the boy, nine and a half years of age, who started with his final attack after arriving in the hospital the night before a contemplated nose and throat operation. Even the hospital authorities didn't recognize the serious character of his trouble until morning and the surgeon barely got the appendix out before rupture. Then there is the girl whose abdominal troubles had not dated from early infancy but only from a first mild attack of what was thought to be appendicitis about one year before. At the time of her operation the anatomical irregularity consisted of inflammatory adhesions at the base. All cases mentioned have, of course, been relieved of their abdominal complaints by the operation.

Discussion

It is assumed that the mechanism in these cases is that of a partial obstruction to the outflow of appendiceal secretions and foreign material which results in a painful spasm and which disappears if and when the obstruction is relieved. The final attack is the one in which obstruction is complete when distention, infection, and destruction of tissue develop with great rapidity—often, as we so frequently find to our sorrow, racing on ahead of all clinical methods of recognition to final gangrene, perforation, and peritonitis.

That secretion does go on within the appendiceal lumen has been abundantly proven by Wangensteen and his associates, and that once obstruction is complete, distention, infection, and gangrene quickly ensue has also been demonstrated by them. It is not easy to find so satisfactory experimental support for the supposition that the varied temporary symptoms have their origin in partial and perodic obstruction. A vicarious help exists in the contemplation of what is known to be the usual reaction of any hollow viscus to blockage of its lumen and the correlation of this action with the vagaries of response to smooth muscle spasm which the sympathetic nervous system displays. It does not seem to far-fetched to surmise that nausea, vomiting, constipation, diarrhea, or pains of a spasmodic character, either local or remote, could find their origin in a trigger mechanism consisting of an appendix in spasm. Principal support for the theory comes, however, from the fact that such symptoms cease to recur after appendectomy.

This paper serves no purpose unless it suggests a means of recognition of the presence of the crippled appendix before its possessor encounters serious difficulty. Obviously, since there is no inflammation, the criteria for the diagnosis of acute appendicitis do not apply except when the process has advanced toward the final phase which *is* acute appendicitis. By the same token, a report of "normal appendix" from the pathologist is not disconcerting. As in intussusception, the history gives the first clue. Its presence should be suspected in every child whose experience, as had Johnny's, has been crowded with gastro-intestinal incidents. If to this history the finding of definite tenderness over the region of the appendix can be added I am almost persuaded that the presence of a "crippled appendix" is assured. X-ray studies may be very valuable, especially if the appendix can be visualized and the tenderness fixed at that area.

Treatment is, of course, the surgical removal of the appendix.

ISOLATION FROM MILK SUPPLIES OF SPECIFIC TYPES OF GREEN-PRODUCING (ALPHA) STREPTOCOCCI AND THEIR THERMAL DEATH POINT IN MILK

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DURING studies on the etiology of various diseases,[6,10,12,13,14,17,27] it was found that culture mediums in common use often did not suffice for the isolation of causative strains of alpha streptococci or for the maintenance of their specific properties. Mediums which I have found especially favorable for the primary isolation and maintenance of characteristic properties of pathogenic alpha streptococci were dextrose-brain broth and soft dextrose-brain agar.

The etiologic relation of streptococci and other organisms found in ra wmilk to various diseases is well recognized. There is a growing conviction among health officers and physicians, especially pediatricians, that pasteurization of milk by present-day methods does not always suffice to prevent epidemic infection.[32] Ayers and Johnson[3] consider pasteurization, as now practised, to be a method of obtaining the thermal death point of only a majority of organisms.

It occurred to me that the mediums found highly favorable for the isolation of causative alpha streptococci from persons ill might also be more suitable than ordinary mediums (1) for the isolation of pathogenic streptococci from milk supplies and (2) as test mediums to determine the thermal death point in milk of alpha streptococci. Accordingly, comparative cultures were made in dextrose-brain broth, dextrose broth and on blood-agar, from samplings of raw and pasteurized milk supplies, from raw milk after pasteurization under controlled conditions in the laboratory, from commercially pasteurized milk after repasteurization, from samplings obtained in a sterile manner directly from cows, and from suspensions of streptococci that had been heated in milk to 63, 68 and 73° C., respectively, for thirty minutes.

It is my purpose at this time to describe the methods used and to report the results obtained in an extended study on the virulence, cataphoretic velocity, serologic properties and heat-resistance of green-producing or alpha streptococci isolated from milk supplies during epidemics and remote from epidemics, and to indicate a pasteurizing temperature which invariably kills specifically virulent alpha streptococci commonly found in milk supplies.

From the Division of Experimental Bacteriology, Mayo Foundation, Rochester, Minnesota. Read before the meeting of the Southern Minnesota Medical Association, Austin, Minnesota, August 23, 1943.

Methods

Samples of milk from supplies studied were obtained through the coöperation of physicians, health officers, hospital superintendents and dairymen and represented a very wide range of conditions as to size and type of epidemics, season, climate, size of dairies and different methods of pasteurization and refrigeration. These included samplings from supplies during studies of eight major epidemics of poliomyelitis, four major epidemics of encephalitis, five distinct outbreaks of persistent epidemic hiccup and seven major epidemics of influenza, in addition to supplies studied during minor outbreaks and in many individual cases. Most of the samples were from grade A supplies and the bacterial content was checked by the constituted authorities and myself by present-day standard methods. The milk had been pasteurized by the holding and flash methods. Inspection of herds for evidence of disease of the udder and in regard to cleanliness in the handling of the milk likewise had been made in the usual manner. Results that were considered as having epidemiologic importance were reported immediately to the constituted authorities in question.

Cultures were made chiefly in tall tubes of dextrose-brain broth, soft dextrose-brain agar, dextrose broth and autoclaved litmus milk, each containing 20 c.c. of medium, and on blood-agar plates. The dextrose-brain broth and soft dextrose-brain agar (0.2 per cent agar) were prepared from 0.2 per cent dextrose broth to which Andrade's indicator (1 c.c. of indicator to 1,000 c.c. of broth) had been added. Pieces of fresh calf brain (approximately 1 part of brain substance to 6 parts of medium) were added to tall columns (10 to 12 cm.) of the medium in tubes or bottles. The reaction of the dextrose broth was brought to pH 7.2 and after the brain sub-

stance had been added, the mediums were autoclaved at 20 pounds' pressure for twenty minutes.

Dextrose-brain broth, dextrose broth and autoclaved litmus milk were inoculated routinely with 2 c.c. of the different samples of milk under study and 0.05 c.c. of the milk was spread on blood-agar plates. After it was found that epidemic strains of streptococci isolated from patients grew in much higher dilution than nonepidemic strains, when subjected to the serial dilution method[16] in the brain-containing mediums, this method was also used in culturing milk to compare colony counts obtained in this way with cultures on blood-agar and with counts obtained by the standard milk-agar plate method.[1]

The serial dilution method,[16] in which it was found that virulent streptococci often grew in far higher dilution than did saprophytic organisms, was also used to obtain pure cultures of streptococci especially suitable for inoculation into animals and for serologic studies. By this method, cultures were made routinely alternately in dextrose-brain broth and dextrose-brain agar, beginning with dextrose-brain broth, thus using four tubes of dextrose-brain broth and three tubes of dextrose-brain agar, or in successive tubes of dextrose-brain agar, each tube containing about 20 c.c. of medium. Just before inoculation, the tubes of mediums were steamed for fifteen minutes in the autoclave and then cooled to 40° C. The first tube in the series was inoculated either with 2 c.c. of milk from a 3 c.c. pipet, making a dilution of 1:10 (10^{-1}), or with a 26-gauge nichrome wire 14 cm. in length, which was dipped into the milk or culture for a distance of 12 cm. and to which there adhered approximately 2 c.mm. of liquid, making a dilution of 1:10,000 (10^{-4}). Two-tenths cubic centimeter, by the pipet method, or 2 c.mm., by the wire method, was transferred serially to the remaining six tubes, at intervals of ten to twelve seconds, making dilution increments of 10^{-2} or 10^{-4}, respectively, at every step. Thorough mixing of the inoculum in each tube was accomplished by rapidly filling and emptying the pipet six times with a rubber bulb of 3 c.c. capacity and by twirling the wire vigorously in each tube. The same pipet was used throughout each series of dilutions and the wire was sterilized in the Bunsen flame only before and after the first transfer. It is to be understood that dilutions made in this way represent dilution of liquids and not necessarily of organisms.

The serial dilution cultures were made in a nonstacked bacteriologic hood under conditions in which control cultures made of sterile material never yielded streptococci. All inoculated mediums were incubated at 34° C. (93.2° F.). Cultures were examined daily for evidence of growth and films were made, stained by Gram's method and counterstained with 2 per cent aqueous solution of safranine 0, and examined microscopically for type of organisms.

Cultures showing streptococci in dextrose-brain broth and dextrose-brain agar were plated routinely on blood-agar to determine their type. The solubility in bile or sodium taurocholate of saline suspensions of the streptococci isolated was tested by the usual methods. The fermentative power of the streptococci isolated was not studied routinely because preliminary studies did not show any correlation between fermentative power and specific virulence, serologic reactions or distribution curves of cataphoretic velocity.

Studies on the resistance of streptococci to heat were made by heating 5 or 10 c.c. of milk naturally contaminated with streptococci and by adding the streptococci to 5 or 10 c.c. of autoclaved milk in glass ampules or bottles. After inoculation the ampules were sealed in the Bunsen flame and the bottles were sealed with sterile, overhanging rubber stoppers. Both were submerged in a water bath during the heating period. Certified thermometers were used to check the temperature in different parts of the pasteurizing bath and of milk contained inside of two ampules or bottles throughout the heating period. In order to be sure that the temperature was the same for each sampling, the water bath containing the samples or bottles was shaken on a shaking machine during the heating period. The temperature of the water in the bath and of the milk in ampules or bottles was increased slowly, so that approximately fifteen minutes were required to bring the temperature from about 25° C. (77° F.) to the required point, or the ampules or sealed bottles were added to the previously heated water, thus simulating the principles used in the commercial holding and flash methods of pasteurization. The heating period of thirty minutes was timed from the moment the temperature of the milk in the control vials and the temperature of the water bath had reached the desired point.

Young (sixteen to twenty-hour) cultures of streptococci in dextrose-brain broth, on isolation

and after prolonged cultivation on artificial mediums, were used to inoculate the autoclaved milk to be heated. Approximately 0.02 c.c. of the dextrose-brain broth culture, or about 1,000,000 organisms, was inoculated per cubic centimeter of the autoclaved milk. To simulate commercial conditions in the handling and use of milk, samples from supplies to be tested and the inoculated specimens often were placed in the refrigerator at 10° C. overnight or longer and then kept at room temperature for short periods before heating. Samples of raw and pasteurized milk and the suspensions of streptococci in autoclaved milk were heated for thirty minutes at 63° C. (145.4° F.), 68° C. (154.4° F.) and 73° C. (163.4° F.), respectively. To determine the presence of viable organisms after heating, subcultures were made routinely in dextrose-brain broth, and often also in dextrose broth, autoclaved milk and on blood-agar, before and after heating.

Rabbits were inoculated intravenously with 0.5 c.c. of undiluted dextrose-brain broth culture per 100 gm. of body weight, and intracerebrally with 0.1 c.c. of 1:200 to 1:10,000 dilutions of eighteen-hour dextrose-brain broth cultures of the streptococci under study. Mice were inoculated intracerebrally with 0.03 c.c. of 1:200 to 1:10,000 dilutions, intraperitoneally with 1.2 c.c. and intranasally, while under deep ether anesthesia, with 0.05 c.c. of the undiluted eighteen-hour dextrose-brain broth cultures of the streptococci.

The distribution curves of cataphoretic velocity and the incidence of agglutination of the streptococci by the respective antistreptococcic serums of comparable strength were determined by methods previously described.[13,17]

Results of Cultures

The incidence of isolations of streptococci in dextrose-brain broth, in dextrose broth and on blood-agar from raw and pasteurized milk supplies and from raw milk obtained in a sterile manner directly from cows, in relation to epidemic diseases and interepidemic periods, is summarized in Table I. It will be seen that the incidence of isolations of streptococci from the three types of milk cultured, but especially from composite raw milk, was uniformly higher, and in most instances much higher, in dextrose-brain broth than in dextrose broth and on blood-agar. There was a much higher incidence of isolation of streptococci from pasteurized samples during epidemic periods than from pasteurized samples during periods remote from epidemics, ranging from 77 per cent during to 18 per cent remote from epidemics. Of 832 samples of raw milk, 75 per cent yielded streptococci in dextrose-brain broth; of 371 samples, 36 per cent yielded streptococci in dextrose broth and of 229 samples, streptococci grew on blood-agar in only 29 per cent. The average incidence of isolations of streptococci from commercially pasteurized milk was 62 per cent in dextrose-brain broth, 33 per cent in dextrose broth and 19 per cent on blood-agar.

The comparative results from the use of different culture mediums in serial dilution cultures for the isolation of streptococci from raw and

TABLE I. ISOLATION OF ALPHA OR GREEN-PRODUCING STREPTOCOCCI FROM RAW AND PASTEURIZED MILK SUPPLIES IN RELATION TO EPIDEMIC DISEASES

Source and type of milk cultured		Results of cultures in: Dextrose-brain broth — Specimens	Dextrose-brain broth — Per cent yielding streptococci	Dextrose broth — Specimens	Dextrose broth — Per cent yielding streptococci	Blood-agar — Specimens	Blood-agar — Per cent yielding streptococci
Poliomyelitis	Raw supplies	206	80	41	30	64	20
	Raw milk, directly from healthy cows	84	90				
	Pasteurized supplies	123	**73**	29	**34**	29	31
Encephalitis	Raw supplies	180	83	65	43		
	Raw milk, directly from healthy cows	33	58	33	30	33	18
	Pasteurized supplies	150	**77**	64	**41**		
Influenza	Raw supplies	60	75	60	52	60	45
	Raw milk, directly from healthy cows	69	55	33	24	32	19
	Pasteurized supplies	58	**53**	58	**45**	58	14
Hiccup	Pasteurized supplies	28	**61**	23	**48**	25	20
Remote from epidemics	Raw supplies	108	79	47	55	40	38
	Raw milk, directly from healthy cows	92	54	92	22		
	Pasteurized supplies	71	**18**	71	**11**	32	16
Total	Raw milk	832	**75**	371	36	229	29
	Pasteurized milk	430	**62**	245	33	144	19

pasteurized milk are well illustrated in Tables II, III and IV. The samples cultured were from a milk supply during a mild epidemic of infection of the upper respiratory tract. The sample of pasteurized milk cultured, in serial dilutions at steps of 10^{-2}, the results of which are shown in Table II, was obtained in the open market and cultures were made immediately. Colony counts, by plating 1 c.c. of a 1:100 (10^{-2}) dilution in milk-tryptone agar, revealed four colonies of bacilli or 400 colonies per cubic centimeter of milk and no colonies of streptococci, whereas streptococci grew in dextrose-brain broth and dextrose-brain agar at dilutions up to and including 10^{-5} using separate pipets, and up to 10^{-7} using the same pipet in making the transfers. The samples of raw and pasteurized milk, cultured in serial dilutions at steps of 10^{-4}, the results of which are shown in Table III, represent a pool of twelve samples of raw milk and the same twelve samples after pasteurization in the laboratory. It will be noted that growth of streptococci occurred in cultures of both the raw and pasteurized milk in the brain-containing mediums more often and in higher dilutions and in larger numbers than in corresponding dilutions in the standard medium, milk-tryptone agar, used routinely for determining the bacterial content of dairy products.[1]

In instances in which milk supplies appeared to be responsible for the occurrence of outbreaks of disease, as referred to later, the milk had been stored for some time or was inadequately refrigerated. Hence, studies were made with my methods to determine whether virulent pneumococci or streptococci added to milk and whether streptococci or other organisms already present in the milk might multiply when kept at standard refrigerator temperatures. Results of these studies are well illustrated in Table IV. Separate, previously sterilized wires were used in making serial dilution cultures in soft dextrose-brain agar and milk-tryptone agar. The sample of pasteurized milk was obtained on the open market during a mild outbreak of infections of the respiratory tract. Twenty cubic centimeter amounts of pasteurized milk were placed in a series of test tubes and approximately 10,000 virulent pneumococci or streptococci were added per cubic centimeter. Dilution cultures at 10^{-4} and 10^{-8} were made immediately and again after storage at 10° C. for forty-eight hours. Estimates of the number of colonies of pneumococci or streptococci that grew in dextrose-brain agar and in the milk-agar plates were made after the respective cultures had been incubated for forty-eight hours. It was found (1) that the number of colonies of pneumococci or streptococci that grew

TABLE II. COMPARATIVE RESULTS FROM THE USE OF DIFFERENT MEDIUMS FOR THE ISOLATION OF ALPHA STREPTOCOCCI IN SERIAL DILUTION CULTURES OF PASTEURIZED MILK

Method of inoculation	Mediums	Incidence of growth in serial dilution cultures of pasteurized milk						
		10^{-1}	10^{-3}	10^{-5}	10^{-7}	10^{-9}	10^{-11}	10^{-13}
Separate pipet at each dilution	Dextrose-brain broth to soft dextrose-brain agar*	Str.,† G+ bac.	180 str.	Str.	0	0	0	0
	Soft dextrose-brain agar to dextrose-brain agar	Str., G+ bac.	110 str.	3 str.	0	0	0	0
	Dextrose broth to soft dextrose agar*	Str., G+ bac.	40 str.	0	0	0	0	0
	Milk-tryptone agar to milk-tryptone agar	G+ bac., str.	4 G+ bac.	0	0	0	0	0
Same pipet for all dilutions	Dextrose-brain broth to soft dextrose-brain agar	Str., G+ bac.	120 str.	Str.	1 str.	0	0	0
	Soft dextrose-brain agar to dextrose-brain agar	Str., G+ bac.	110 str.	12 str.	0	0	0	0
	Dextrose broth to soft dextrose agar	Str., G+ bac.	40 str.	0	0	0	0	0
	Milk-tryptone agar to milk-tryptone agar	G+ bac., str. 0	3 G+ bac.	1 G+ bac.	0	0	0	0

*Alternate tubes of the respective mediums were used.
†Str. = streptococci; G + bac. = gram-positive bacilli.

TABLE III. COMPARATIVE RESULTS FROM THE USE OF DIFFERENT MEDIUMS FOR THE ISOLATION OF ALPHA STREPTOCOCCI IN SERIAL DILUTION CULTURES OF CORRESPONDING SAMPLES OF RAW AND PASTEURIZED MILK

Milk	Method of inoculation	Mediums (alternating)	Time	Growth in serial dilution cultures of milk supplies: Raw 10^{-4}	Raw 10^{-8}	Raw 10^{-12}	Raw 10^{-16}	Raw 10^{-20}	Raw 10^{-24}	Raw 10^{-28}	Pasteurized 10^{-4}	Pasteurized 10^{-8}
Undiluted	Separate sterile wire at every transfer	Dextrose-brain broth to soft dextrose-brain agar		Str.,* GO+ bac.	22 str.	Str.	0	0	0	0	Str., GO+ bac.	2 str.
		Soft dextrose-brain agar to dextrose-brain agar		Str., GO+ bac.	30 str.	1 str.	0	0	0	0	130 str.; GO+ bac.	0
		Milk-tryptone agar to milk-tryptone agar		GO+ bac., few str.	2 GO+ bac.	0	0	0	0	0	18 GO+ bac.	0
Diluted 1:100 in water	Same wire, not sterilized between transfers	Dextrose-brain broth to soft dextrose-brain agar	Immed.†	Str., GO bac.	50 str.	Str.	20 str.	Str.	18 str.	Str.	Str.	1 str.
			30 min.‡	Str., GO bac.	25 str.	Str.	6 str.	Str.	0	0	Str.	0
		Soft dextrose-brain agar to dextrose-brain agar	Immed.	Str., GO bac.	40 str.	0 str.	4 str.	6 str.	10 str.	0	12 str.	1 str.
			30 min.	Str., GO bac.	12 str.	0	2 str.	0	0	0	4 str.	0
		Milk-tryptone agar to milk-tryptone agar	Immed.	34 col., few str.	0	0	0	0	0	0	12 col., str. 0	0
			30 min.	36 col., few str.	2 GO bac.	0	0	0	0	0	10 col., str. 0	0

*Str. = streptococci; GO, G+ bac. = gram-negative or gram-positive bacilli.
†Serial dilution cultures of milk were made immediately after dilution of the milk in water.
‡Serial dilution cultures of milk were made 30 minutes after dilution of the milk in water.

at dilutions of both 10^{-4} and 10^{-8} in the test cultures made immediately and after refrigeration at 10° C. for forty-eight hours was far greater in soft dextrose-brain agar than in milk-tryptone agar; (2) that the number of colonies of pneumococci or streptococci that grew at 10^{-8} was far greater after the milk to which these organisms were added had been refrigerated for forty-eight hours than in cultures made immediately, and (3) that the streptococci which had resisted commercial pasteurization also grew at refrigerator temperature.

The incidence of growth of alpha streptococci and of gram-positive and gram-negative bacilli in serial dilution cultures, alternately in dextrose-brain broth and dextrose-brain agar, of milk supplies in relation to epidemics of encephalitis, poliomyelitis, infections of the respiratory tract including influenza, and hiccup and to periods remote from epidemics is shown graphically in Figure 1. Each dilution culture was made with the same sterile pipet or with the same wire sterilized only before and after the first transfer. It will be seen (1) that incidence of growth of streptococci was higher from raw than from pas-

TABLE IV. GROWTH OF VIRULENT PNEUMOCOCCI AND ALPHA STREPTOCOCCI IN PASTEURIZED MILK AT 10°C.

Pasteurized milk +10,000 virulent pneumococci or streptococci per cubic centimeter		Results of serial dilution cultures in: Dextrose-brain agar, Immediately after inoculation of milk; Colonies of pneumococci or streptococci at dilutions of 10^{-4}	Dextrose-brain agar, Immediately after inoculation of milk; 10^{-8}	Dextrose-brain agar, Immediately after inoculation of milk; 10^{-8}	Dextrose-brain agar, After storage of milk for 48 hours at 10°C.; 10^{-4}	Dextrose-brain agar, After storage of milk for 48 hours at 10°C.; 10^{-8}	Dextrose-brain agar, After storage of milk for 48 hours at 10°C.; 10^{-8}	Milk-tryptone agar, Immediately after inoculation of milk; 10^{-4}	Milk-tryptone agar, Immediately after inoculation of milk; 10^{-8}	Milk-tryptone agar, Immediately after inoculation of milk; 10^{-8}	Milk-tryptone agar, After storage of milk for 48 hours at 10°C.; 10^{-4}	Milk-tryptone agar, After storage of milk for 48 hours at 10°C.; 10^{-8}	Milk-tryptone agar, After storage of milk for 48 hours at 10°C.; 10^{-8}
Pneumococci	Type I	90	3	22	10	0	10						
	Type II	8	0	90	0	0	15						
	Type III	90	2	48	30	0	17						
Alpha streptococci	A	720	3	20	0	0	12						
	B	250	1	80	150	0	8						
	C	320	2	50	80	0	4						
	D	380	45	40	120	0	7						
	E	850	8	80	0	0	14						
	F	220	4	35	50	0	12						
Control: uninoculated pasteurized milk		3	0	12	0	0	3						

teurized milk supplies during epidemics of encephalitis and remote from epidemics; (2) that the incidence of growth of streptococci from raw milk supplies cultured during epidemics of encephalitis, while about the same in low dilutions, was much greater in high dilutions than in corresponding cultures from raw milk supplies remote from epidemics; (3) that growth of streptococci from pasteurized milk supplies was consistently much higher, in both low and high dilutions, during epidemics of encephalitis, poliomyelitis, infections of the upper respiratory tract including influenza, and hiccup, than remote from epidemics; (4) that the incidence of growth of gram-positive and gram-negative bacilli from pasteurized milk supplies in the different dilutions, but especially in high dilutions, was far less than of streptococci and was about the same for epidemic and nonepidemic periods, and (5) that the average number of colonies of streptococci that grew in high dilutions in dextrose-brain agar was higher for raw than for pasteurized milk supplies, both during and remote from epidemics of encephalitis.

The control colony counts, by the standard agar plate method, of samples of milk subjected to serial dilution cultures in the experiments summarized in Figure 1 and in many other experiments were usually well within prescribed limits. Streptococci almost never grew in the standard milk-agar plates at dilutions of more than 1:1,000 and never at dilutions greater than 10^{-3} in serial dilution cultures made in this medium, whereas corresponding dilution cultures made in the brain-containing mediums often yielded streptococci in far greater dilutions. Staphylococci were isolated infrequently from pasteurized milk. They were isolated more often from raw milk in low dilutions, but only occasionally in high dilutions.

The growth of streptococci in dilutions far greater than those believed possible on the basis of mathematical calculations of the original number of streptococci, considering streptococci as inert particles, is thought to be due to either "biogenesis" or growth of submicroscopic units while the dilutions are made or to differential adhesion of the streptococci, as such, or of submicroscopic components, to the wire or to the surface of the pipets used in making the dilutions. The dilutions, as indicated, represent dilution of fluids and not necessarily of organisms.

GROWTH OF ALPHA STREPTOCOCCI AND GRAM-POSITIVE AND GRAM-NEGATIVE BACILLI IN SERIAL DILUTION CULTURES OF MILK SUPPLIES

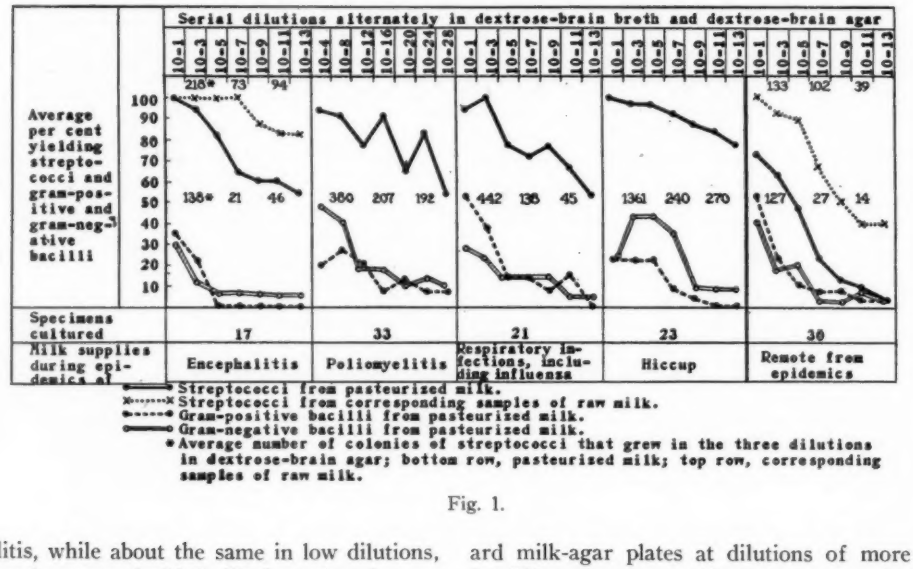
Serial dilutions alternately in dextrose-brain broth and dextrose-brain agar
Average per cent yielding strepto-cocci and gram-pos-itive and gram-neg-ative bacilli
218* 73 94
138* 21 46
380 207 192
442 138 45
1361 240 270
133 102 39
127 27 14
Specimens cultured
17
33
21
23
30
Milk supplies during epi-demics of
Encephalitis
Poliomyelitis
Respiratory in-fections, inclu-ding influenza
Hiccup
Remote from epidemics
Streptococci from pasteurized milk.
Streptococci from corresponding samples of raw milk.
Gram-positive bacilli from pasteurized milk.
Gram-negative bacilli from pasteurized milk.
*Average number of colonies of streptococci that grew in the three dilutions in dextrose-brain agar; bottom row, pasteurized milk; top row, corresponding samples of raw milk.

Fig. 1.

(To be concluded in July issue.)

MINNESOTA MATERNAL MORTALITY STUDY

General Summary

By the Maternal Mortality Committee of the Committee on Maternal Health of the Minnesota State Medical Association

From July 1, 1941 through June 30, 1942 a State-Wide Maternal Mortality Study was carried out through funds provided by the Division of Child Hygiene, Minnesota Department of Health, from regular allotments administered by the Children's Bureau, U. S. Department of Labor, under the provisions of the Federal Social Security Act.

This was made a coöperative enterprise of the Minnesota State Medical Association and the Minnesota Department of Health and was conducted by a group of physicians known as the Minnesota Maternal Mortality Committee. The committee members, selected from different parts of the state, served without remuneration and were appointed by the two sponsoring organizations, the Maternal Health Committee of the State Medical Association acting for its parent organization and actually motivating the study. The committee met as often as necessary to formulate plans and to review each case study. A staff of three young, well-trained obstetricians was maintained to carry on the field work of the study and met with the committee in order to supply additional information about case studies if possible and when requested by committee members.

Reports of maternal deaths were made directly, or through the Division of Birth and Death Records and Vital Statistics, to the Division of Child Hygiene of the Minnesota Department of Health. The investigator was promptly dispatched to the physician signing the death certificate and obtained an exhaustive study from the physician and all other persons and records made available by the physician. Actually a 20-page questionnaire was filled out and the case study summarized. The record was next reviewed by a committee member and again summarized in detail. Finally, the study was presented to the committee as a whole and always as an anonymous case. At this time the cause of death was ascertained from the study, preventability determined, responsibility for death affixed, et cetera, before the case was closed.

The following tables, figures and comments comprise only the general statistical report. An important fund of information is contained in these case studies and many aspects of the study will be presented elsewhere in more detail. In interpreting the details of this report, it must be borne in mind that the study is made up only of those patients who *died* during this period. There is no justification for assuming that the information obtained represents in any way a sample of the practice of obstetrics in the State of Minnesota. By the same token, there is no information available at present which would justify a complacent attitude. Until such information is forthcoming, it would be prudent to consider the obstetrics situation as manifested in this report as at least indicating the direction in which efforts at improvement should be pointed.

TABLE I. SOURCE OF REPORTING OF MATERNAL DEATHS

	No. of Cases	Per Cent of Cases
Division of Vital Statistics	69	61.6
City Health Departments	20	17.8
Hospitals	7	6.2
Matching Birth and Death Certificates	7	6.2
Physicians	6	5.4
District Health Departments	2	1.8
Social Welfare Organizations	1	0.9
Totals	112	99.9

The source from which maternal death reports were obtained is recorded in Table I. At the time the study was begun, each physician, hospital, city health department and district health department in the State of Minnesota was requested each to report maternal deaths to the State Department of Health promptly by telephone or letter in order that the cases might be studied while the unrecorded facts surrounding the deaths were still fresh in the memories of physicians, hospital attendants, etc., caring for the patient in her last illness. The normal course of reporting through the Division of Birth and Death Records and Vital Statistics of the Minnesota Department of Health would mean that each report could be a month or more old before it reached the attention of the committee, thus decreasing materially the value of the individual study. This delay was not avoided in seventy-six instances, or 67.75 per cent of the 112 cases. Only thirty-six, or less than one-third, were promptly reported to the Division of Child Hygiene of the Minnesota Department of Health.

Special attention must be called to the seven cases which were discovered by the Division of Birth and Death Records and Vital Statistics in matching birth and death certificates. The current death certificate form requests mention of pregnancy if such has occurred within three months of the maternal death. For the express purpose of determining the percentage of maternal deaths lost each year as a result of the failure on the part of the signer of the death certificate to answer accurately this question, the following arduous task was undertaken by the staff of the Division of Birth and Death Records and Vital Statistics. The death certificate of each female dying during the childbearing years, 15 to 49 inclusive, was taken to the files of birth certificates and these were searched to determine whether a birth had been registered under the name of the deceased within three months of the date of death. As noted above, this search brought to light

seven cases in the twelve months of the study. In other words, the maternal death rate as determined from the death certificates for the full year represented by this study would be understated by 6.25 per cent. Moreover, the implication is that the Minnesota

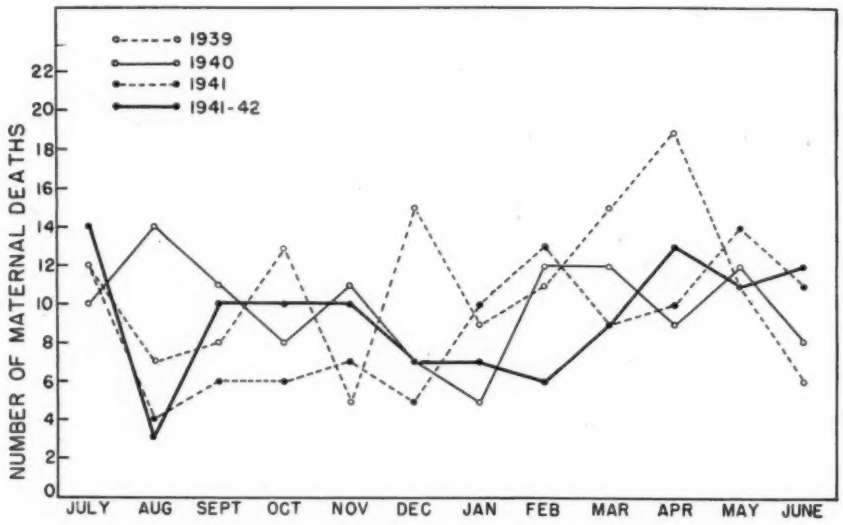

Fig. 1. Number of maternal deaths in each month for the year of this study (1941-42) compared with maternal deaths by months for the years 1939, 1940 and 1941. The annual maternal mortality rates (deaths per thousand live births) were: 1939, 2.7; 1940, 2.2; 1941, 2.0; 1941-42, 2.06.

maternal mortality rate each year is being underestimated by approximately 0.13 points. The 1941 rate of 2.0 should in reality be 2.13 maternal deaths per 1,000 live births. Whether a similar error exists in other states and in the United States Census Bureau reports should be determined by tests of the accuracy of death certificates similar to the test utilized in this study.

Further analysis of these seven cases reveals nothing but carelessness to account for omission of mention of the recent pregnancy on the death certificates. In fact, in three cases an obstetrical complication was the immediate cause of death; in two others, it was pulmonary tuberculosis with death occurring in state sanitoria, in one there was bowel obstruction from undiagnosed carcinoma of the transverse colon, and in the other carcinomatosis from a malignant melanoma of the scalp. In only one instance was delivery attended by a physician or institution other than the one recording the maternal death. Delivery and death occurred on the same day in one case, three days apart in a second, and less than six weeks apart in two others.

Figure 1 records the number of maternal deaths for each month of this study, July, 1941, through June, 1942. For purposes of comparison, the number of maternal deaths per month for the calendar years 1939, 1940, and 1941 are included in this graph. In the legend are recorded the maternal death rates for each of these calendar years as well as the year of this study. The number of live births per month did not vary within any wide limits and the calculated maternal death *rate* per month for 1941-1942 follows the recorded upward and downward trends of actual maternal deaths. It is thus fair to say that there is no clear-cut seasonal variation for the year of study. The same chance variation is seen in each calendar year included for comparison. There is a tendency for the maternal death rate to be above the average in the late winter and early spring and to be below this level in the fall and early winter. Since infections account for a goodly percentage of maternal deaths, one might have expected higher rates in the months in which upper respiratory infections are more common.

It is of interest to note that the yearly fall in maternal death rate which began more than a decade ago, persisted through 1941. Moreover, mention must be made of the fact that the maternal death rate for the year of this study, namely 2.03, is based on the total number of maternal deaths associated with pregnancy and childbirth, whereas all other figures are calculated after eliminating certain deaths which the U. S. Census Bureau does not recognize as maternal deaths. If this scale, following certain corrections, is also applied to our figures for 1941-42, the resultant rate would be lower than stated above and would be comparable to all other quoted and calculated rates. We are unable to supply the corrected figure since we do not know which cases the Statistician of the Minnesota State Department of Health has corrected out.

In consideration of race of the patients in this study, half-breed Indians and negroes are classified with the

TABLE II. AGE OF MOTHER AT LAST BIRTHDAY

Age of Parent	No. of Cases	Per Cent of Cases
15-19	3	2.7
20-24	21	18.8
25-29	26	23.2
30-34	17	15.2
35-39	28	25.0
40-over	17	15.2
Totals	112	100.1

TABLE III. PLACE OF DEATH TABULATED WITH PLACE OF DELIVERY

Place of Death	Place of Delivery	No.	Per Cent
Urban Hospital	Hospital 35 Home 5 Died undelivered 12	52	46.4
Rural Hospital	Hospital 31 Home 9 Died undelivered 8	48	42.8
Home	Hospital 2 Home 7 Died undelivered 3	12	10.7
Totals		112	99.9

TABLE IV. PARITY OF MOTHERS DYING DURING PREGNANCY, LABOR OR THE PUERPERIUM

		No.	Per Cent
Primiparas	Primigravidas 33 Essential primiparas 3	36	32.1
Multiparas	Para 1 21 2 13 3 11 4 7 5 4 6 4 7 5 8 6 9 1 10 1 12 1 14 1 15 1	76	67.9
Totals		112	100.0

full-blooded members of those races. Analysis reveals one negress, five Indians, and 106 white women. The numbers in the first two groups are too small to allow significant conclusions.

Age of the mother at her last birthday is recorded in Table II. Of the patients in the oldest age group, seven were forty years old on their last birthdays, four were forty-one, four were forty-two, and one each was forty-four and forty-six years old. We do not at present know the age grouping of the mothers of all live births in the state for this study period so that the value of these figures is not clear. One would suspect that they correspond to those of this study. In view of Eastman's[1] contention that the hazards of child-bearing in the grand multipara, and therefore in the aging patient as well, are tremendously increased, we would like to be able to verify or to refute the statement by the figures of this study. It does seem significant, however, that 40 per cent of the mothers losing their lives in association with pregnancy and childbirth were more than thirty-four years old.

Yerushalmy, Palmer, and Kramer[6] have shown a definite increase in the "puerperal fatality rate" with each older age bracket. Under twenty years of age this rate was 1.5 per 1,000 total deliveries, at thirty through thirty-four years it was 3.3, and at an age of forty or more years it was 7.5. Peckham's figures[3] follow the trends shown by Yerushalmy except that in the former's smaller series there is a high rate in the youngest age bracket.

As for marital status of each mother, 106 were said to have been married and six unmarried. All married mothers were declared to have had legitimate pregnancies. Yerushalmy, Kramer, and Gardner[4] showed that unwed mothers who were delivered of viable offspring were exposed to fatality rates which were practically the same as those of married mothers. The infants of the unmarried mothers, on the other hand, had mortality rates which were fully twice as great as for the infants of combined married and unmarried mothers.

Delivery occurred in a hospital in sixty-eight or 61 per cent of the 112 instances and in the home twenty-one times (19 per cent) while twenty-three, or 20 per cent, died undelivered.

Place of delivery is recorded in Table III with place of death. The great majority of deaths occurred at the institution of admission for delivery or care in the last illness. Minnesota had a 20 per cent higher incidence of hospital deliveries than did the counties of Maryland (Peckham[3]), and death occurred in a hospital in less than two-thirds of the latter cases while 90 per cent of Minnesota's maternal deaths occurred in hospitals.

In the following consideration of parity, the current pregnancy is not included, primiparas includes both primigravidas and essential primiparas, and multiparity includes prematures as well as postmature and full-term deliveries. The full value of these figures cannot be determined since the parity of all mothers giving birth to living children in Minnesota during the year of this study is not known. The small number of grand multiparas here might suggest that Eastman's contention[1] is not verified in this series of maternal deaths. It will be recalled that his material presented a gross maternal mortality rate of 4.2, with the rate in the lower parity brackets (I to V) ranging between 3.55 and 3.78 whereas it soared to 11.73 with a parity of nine or more, a threefold increase. In Yerushalmy's[6] larger series, the "puerperal fatality rate" with the first viable pregnancy is higher (2.8) than with the second and third pregnancies (2.0 and 1.9 respectively) but with increasing parity above these grades, the rate

TABLE V. DURATION OF PREGNANCY AT DELIVERY OR AT DEATH IF THE MOTHER DIED UNDELIVERED

Stage of Pregnancy	Duration of Pregnancy	Died Undelivered	No.	Per Cent
Abortion			23	20.5
	Unknown 1	1		
	4 wks. 1			
	5- 8 wks. 4	2		
	9-12 wks. 2			
	13-16 wks. 9	3		
	17-20 wks. 4	1		
	21-24 wks. 1	1		
	25-28 wks. 1			
Premature			21	18.9
	29-30 wks. 9	3*		
	31-32 wks. 5	2		
	33-34 wks. 4			
	35-36 wks. 3	1		
Term			53	47.3
	36-38 wks. 21	7*		
	39-40 wks. 32			
Postmature			15	13.4
	41 wks. 8			
	42 wks. 7	2		
Totals		23	112	100.1

*One of these delivered by postmortem cesarean section.

TABLE VI. ATTENDANT AT DELIVERY OF PATIENT.

	No. of Cases	Per Cent	Per Cent Excluding Died Undelivered
Died undelivered	23	20.6	
Unattended	10	9.1	11.2
Self-induced abortion	3	2.8	3.4
Nurse	1	0.9	1.1
Locum tenens physician	1	0.9	1.1
Physician in general practice	54	42.3	60.7
Obstetrician	12	10.1	13.5
American Board Diplomates 10			
Self-styled 2			
Resident house officer	8	7.2	9.0
Totals	112	99.9	100.0

TABLE VII. CONDITION OF PATIENT UPON HOSPITALIZATION OR WHEN FIRST SEEN RELATIVE TO LAST ILLNESS

	No.	Per Cent
Well	43	38.4
Ill	63	56.2
Critically ill	4	3.6
Dead	2*	1.8
Totals	112	100.0

*One of these was apparent suicide and the other either suicide or homicide.

rises appreciably as shown by Eastman, but with the greatest rate in the para VIII and IX group (6.3) and a fall to 4.4 in the group of para X and over.

Duration of pregnancy is recorded in Table V and refers to weeks of gestation at the time of delivery or of death if the latter preceded delivery. Abortion was diagnosed whenever the pregnancy had not advanced through the twenty-eighth week or, where no accurate menstrual history was available, when the fetus weighed less than 1500 grams and measured less than 35 cm. in crown-heel length. The extra-uterine pregnancies are all included under abortions since none of the ectopics were carried to fetal viability. In the absence of a reliable menstrual history, a pregnancy was considered to have carried to term when the fetus weighed at least 2500 grams (5½ pounds) or measured at least 45 cm. in total length. A fetus was considered postmature when it weighed at least 4000 grams (9 pounds), although this might better be considered only as excessive size. Peckham[3] found comparable percentages of maternal deaths associated with abortions, prematures and term deliveries, but recorded no postmature deliveries. Yerushalmy[6] found the puerperal fatality to be seven times as high when pregnancy terminated prematurely as when delivery was at term. It will be seen that we had three times as many maternal deaths associated with term and postmature as with premature deliveries. However, since the incidence of the latter deliveries is low, it is conceivable that our maternal mortality rates in these groups might confirm Yerushalmy's figures for "puerperal fatality" rates. We do not have for comparison the incidence of premature deliveries in Minnesota.

Attendant at delivery is given in Table VI. The delivery was considered unattended whenever there was no supervision for delivery of the child even though a physician may have arrived for delivery of the placenta. The incidence of unattended deliveries, actually 11.2 per cent when patients who died undelivered are excluded, is surprisingly high. No patients were delivered by midwives, all attendants at delivery being physicians except in one instance when a nurse functioned in the absence of the physician, and in the three admitted self-induced abortions. In Maryland, where midwives attend many deliveries in the outlying counties, Peckham[3] noted that one out of every fourteen maternal deaths was chargeable to midwives.

Condition of the patient upon hospitalization or when first seen at house or office relative to the last illness is shown in Table VII. The interpretation placed upon the condition of the patient was most liberal. For example, there were many patients who had been seen for prenatal care, whose records showed abnormalities which should have been further investigated but who were allowed to go home, and when next seen were not well but ill or even critically ill. In these instances the condition of the patient when next seen was applied to the case. Even with this liberal interpretation, the fact that forty-three patients (38.4 per cent) were well when first seen and died later is startling.

The adequacy of consultation is recorded in Table VIII. A consultation was considered adequate when the patient was actually seen and examined by the

TABLE VIII. ADEQUACY OF CONSULTATION

		No.	Per Cent
None		63	56.2
Adequate throughout		10	9.1
Inadequate		39	34.8
By obstetrician	11		
By other specialist	7		
By other general practitioner	19		
By general surgeon	2		
Totals		112	100.1

TABLE IX. PRESENTATION AND POSITION OF FETUS WITH DURATION OF PREGNANCY

Presentation and Position	Duration of Pregnancy	No.	Per Cent
Vertex		62	55.3
	Premature 11		
	Term 38		
	Postmature 13		
Others		10	9.1
Breech 7			
	Premature 3		
	Term 4		
Transverse 2			
	Premature 1		
	Term 1		
Face (postmature) 1			
Unknown		40	35.7
	Abortions 17		
	Premature 6		
	Term 10		
	Postmature 1		
	Ectopic 6		
Totals		112	100.1

consultant and when he recognized the minimum standards as set down by this Committee. "Curbstone" consultations were included though always placed in the inadequate group. The absence of any consultation in 56 per cent of the cases, the presence of less than 10 per cent adequate consultations, and the inadequacy of two-thirds of the consultations which were obtained raises certain obvious questions. There can be no reasonable doubt but that a considerable number of these patients would not have died, had reasonably efficient consultation been obtained and reasonable therapy instituted. This must have been the experience with other maternal mortality studies since several states have instituted means of supplying consultation for all obstetric complications. One of these systems was instituted in 1937 by the State Department of Health in Connecticut[2] but the effects upon the maternal mortality rate are not known. Perhaps the best of these has been organized in the City of Chicago. This method of reducing the maternal mortality rate may not produce the desired results, for one-half of the inadequate consultations in our series were supplied by specialists, men who by training and experience should be capable of furnishing superior counsel.

Presentation and position of fetus with duration of pregnancy are recorded in Table IX. The value of these figures is not clear without knowing the incidence of the various presentations and positions in all deliveries of living children in Minnesota for the period of the study. In breech, face, and transverse presentations, the incidence of placenta previa, infection, et cetera, was no greater than in the vertex positions.

TABLE X. OUTCOME TO CHILD AND DURATION OF PREGNANCY

Outcome to Child	Duration of Pregnancy	No.	Per Cent
Born alive and survived		46	41.1
	Premature 2		
	Term 37		
	Postmature 7		
Born alive and died neonatally		7	6.2
	Premature 5*		
	Term 2		
Stillborn		23	20.5
Macerated 9			
	Premature 4		
	Term 4*		
	Postmature 1		
Non-macerated 14			
	Premature 5		
	Term 4		
	Postmature 5		
Ectopic gestation		6	5.4
Abortions		17	15.2
Others (died undelivered, et cetera)		13	11.6
	Premature 5		
	Term 6		
	Postmature 2		
Totals		112	100.0

*Includes one postmortem cesarean section.

From Table X it is seen that only 41 per cent of the deliveries associated with maternal deaths terminated in the birth of a living child, 26.7 per cent ending in stillbirths or neonatal deaths, and 11.6 per cent dying undelivered with viable pregnancies. Considering all viable fetuses, a stillborn and neonatal death rate of 38.3 per cent was obtained. These figures coincide with those of Peckham.[3] Yerushalmy[4] found a strong association between death of mother and loss of offspring. His "puerperal fatality" rate was two per 1,000 total deliveries when the infant was born alive and thirty when the infant was born dead. The rate was 1.7 for mothers whose infants survived the neonatal period and eleven for mothers whose infants died under one month of age. Similarly, the stillbirth rate was 27.0 per 1,000 total births for infants of surviving mothers and 300.4 for infants whose mothers died in childbirth. The corresponding neonatal mortality rates were 22.8 and 167.3 per 1,000 live births.

The type of delivery is recorded with duration of pregnancy in Table XI and total operative procedures appear in Table XII. The first of these tables shows the unfortunately high incidence of operative deliveries, 56.2 per cent of the patients who delivered before death. This is considered unfortunate since some of the deaths resulted directly from the operative procedures. In some instances there was no indication for operation, while in others ill-advised operative procedures were done or attempted. The average number of operative procedures done or attempted per operated

TABLE XI. TYPE OF DELIVERY WITH DURATION OF PREGNANCY

Type of Delivery	Duration of Pregnancy	No. of Cases	Per Cent of Cases	Per Cent Omitting Died Undelivered
Died undelivered		23	20.5	
	Ectopic gestation 3			
	Abortion 5			
	Premature 6*			
	Term 7*			
	Post-mature 2			
Spontaneous		39	34.8	43.8
	Abortion 10			
	Premature 6			
	Term 19			
	Post-mature 4			
Operative		50	44.6	56.2
	Ectopic gestation 3			
	Abortion 2			
	Premature 9			
	Term 27			
	Post-mature 9			
Totals		112	99.9	100.0

*Includes one postmortem cesarean section.

patient was 1.5. Peckham's series[3] presented a lower incidence of deaths before delivery (10 per cent) and higher incidence of spontaneous deliveries (60 per cent).

It is not possible in this statistical survey to discuss completely the field of operative procedures done or attempted in this series. Separate communications will follow and will detail this phase of the study. Minor comments, however, cannot be avoided here.

One-third of the patients with fatal extra-uterine pregnancies died without laparotomy because of delay in hospitalization or institution of therapy for hemorrhage and shock. One of those operated upon did not have a salpingectomy performed but instead a "ligation of the fallopian tube." Hemorrhage continued and was soon followed by death. Both of the remaining two who had salpingectomies performed also had appendectomies done. One of these operations was followed by peritonitis and death but the primary cause of death in the other was alkalosis due to prolonged gastric or duodenal suction without replacement of fluids or salt. The sixth patient with a tubal pregnancy had an appendectomy performed without exploration of the pelvic organs in spite of a history suggestive of pregnancy. Death, which was due to peritonitis, occurred ten days after appendectomy and the unruptured tubal pregnancy was discovered at autopsy. Two patients were delivered by postmortem cesarean section. From one of these a term but stillborn and macerated fetus was obtained. The other fetus, which was delivered after maternal death due to pneumonia, was premature (thirty weeks' gestation) and succumbed soon after its delivery.

The presence of three instances of mid forceps, four of successful or attempted high forceps deliveries and ten of podalic version as compared to fourteen low forceps deliveries appears to be evidence of radical obstetrics. This is all the more apparent when one investi-

TABLE XII. TOTAL OPERATIVE PROCEDURES DONE OR ATTEMPTED UPON FIFTY-FOUR PATIENTS

Operation	No. of Operations	Per Cent of Operations
Surgical induction of labor	5	6.1
Bag, Voorhees 3		
Membrane rupture 2		
Dilatation and curettage	3	3.7
Low forceps delivery	14	17.3
Mid forceps delivery	3	3.7
High forceps delivery (two unsuccessful)	4	4.9
Breech extraction	3	3.7
Manual "dilatation" of cervix	7	8.6
Podalic version with extraction	10	12.3
Hysterectomy (excluding one radical C.S.)	1	1.2
Cesarean section	12	14.8
Elective 7		
Nonelective 5		
Craniotomy, after-coming head (hydrocephalus)	1	1.2
Ligation fallopian tube (tubal pregnancy)	1	1.2
Salpingectomy with appendectomy (tubal pregnancy)	2	2.5
Appendectomy (associated with tubal pregnancy)	1	1.2
Manual removal of placenta	4	4.9
Tamponade of vagina (placenta previa)	2	2.5
Tamponade of uterus	6*	7.4
Postmortem cesarean section	2	2.5
Totals	81	99.7

*Two patients had their uteri packed twice.

gates certain operative deliveries. In one case, high-forceps delivery was done on a macerated fetus, the patient being in diabetic acidosis. In another, high-forceps delivery was attempted upon an undiagnosed hydrocephalic fetus and when this operation failed, version was followed by craniotomy to the after-coming head. One patient with outspoken cardiac failure had delivery attempted by high forceps but accomplished by version and extraction when the umbilical cord prolapsed. In two instances podalic version was done after long labors with premature rupture of membranes and a macerated fetus was delivered in each instance. Three patients with placenta previa were delivered hastily by version with extraction and none of these had had preliminary treatment with an intra-uterine bag. In one instance, mid-forceps delivery attempted without an indication was followed by version and death due to hemorrhage from extensive unrepaired lacerations of the whole birth canal. Podalic version was done once because of a transverse presentation which was not diagnosed until late in labor although the patient was hospitalized and "seen" early in labor. In a patient who had been in an automobile accident, which resulted

TABLE XIII. ADEQUACY OF POSTMORTEM EXAMINATIONS

Type of Autopsy	No.	Per Cent	
Obtained, adequate	9	8.0	32.1%
Obtained, inadequate	27	24.1	
Not requested by physician	55*	49.1	67.9%
Requested but refused	21	18.8	
Totals	112	100.0	

*Includes three cases which should have had autopsies demanded by the coroner since each was unexplained suicide or homicide.

in an unexplored acute abdomen, delivery was effected by version and extraction. Autopsy revealed a ruptured uterus which may have followed either the accident or the operative delivery.

In this last-named case, in one of the patients with prolonged labor and premature rupture of the membranes, and in three with placenta previa, delivery was preceded by manual "dilatation" of the cervix. A fourth patient with placenta previa was delivered by breech extraction after manual "dilatation" of the cervix. Only one of these four patients with placenta previa survived beyond the immediate puerperium, and she died of puerperal sepsis eleven days later. The seventh patient upon whom manual "dilatation" of the cervix was carried out was admitted to a rural hospital in cardiac failure with advanced arteriolosclerosis. An attempt to induce labor immediately by membrane rupture (thirty-nine weeks' gestation) was not promptly successful and manual "dilatation" of the cervix was carried out after an attempt at high forceps had failed.

The handling of placenta previa was worse than that accorded to any other obstetric complication in this series. This will be reported in detail elsewhere. It is quite clear that some curb must be placed by hospitals upon the treatment of this condition. Indeed, in some instances even this will not be enough.

The cesarean section record in this series must be given serious consideration. Fifteen per cent of the operative procedures were cesarean sections. Five were done from eight to 120 hours after the onset of labor. One classical cesarean section was done after sixty hours of labor. This latter patient succumbed to a postpartum hemorrhage three hours after delivery while death in all others was due to infection and occurred seven to forty-two days after delivery. The elective cesarean sections are equally worthy of note. One patient with preëclampsia superimposed upon an arteriolosclerosis died two hours after delivery because of too long delayed therapy for shock. Two survived the operation by two days to succumb to cardiac failure and to eclampsia which may have been precipitated by intramuscular pituitrin. The remaining four of the seven delivered by elective cesarean section died of infection, eight, fifteen and sixteen days, and nineteen weeks after delivery. In the last of these peritonitis followed non-surgical treatment of small bowel obstruction. The many other details of these cesarean section deaths will be reported separately.

The poor showing as regards postmortem examinations is depicted in Table XIII. Only 8 per cent of the cases had autopsies which could be considered adequate, i.e., complete enough, as determined from symptomatology, to arrive at a reasonably accurate cause of death. Three times as many were incomplete on cursory examinations, or were so poorly performed that even the examiner could not give an accurate gross description of the lesion or the tissues. In one-half of the cases, the attending physician did not request permission for autopsy. The evasive answers to this part of the questionnaire make it certain that in many of the remaining 19 per cent, in which postmortem examination is said to have been requested but refused by responsible relatives, the physician made no honest effort to obtain permission for the examination. Interrogations to the question of whether an autopsy was performed, brought such replies as: "We have no pathologist available," "autopsies are not generally done in this community," and "I would have had to do it myself and just don't have time." It appears that in certain localities in the state it is customary to charge a fee for postmortem examination, since several replies stated that the family "could not afford" such an examination. In one instance the consultant was certain that death was due to peritonitis following an elective cesarean section but the family physician refused to request permission for autopsy, saying that "what the family didn't know wouldn't hurt them."

The failure of coroners to perform their duties and to request or demand postmortem examinations on those patients dying under circumstances suggestive of violence is outstanding. In one instance, death is believed to have been due to suicide (veronal poisoning). A cursory postmortem examination was done and the cause of death given on the death certificate as diabetes "in order to save the family the disgrace of a suicide death." There was apparently no investigation by a law-enforcement body and the suicide is only inferred from meager data. In a second instance, a young woman said to have been healthy was found dead on a sleeping porch adjoining the bedroom occupied by her and her husband. The latter was not aroused during the night but made the discovery upon arising the next morning. Postmortem examination was not requested or ordered and no investigation was held. The death certificate was signed by the coroner and the assigned cause of death was fictitious, the physician who had supplied prenatal care attempting to supply an explanation for death without seeing the corpse. In the third instance, a patient who had postpartum sepsis, eclampsia, and psychosis was missing from her hospital room one afternoon. Her body was discovered the following morning in a nearby lake. Postmortem examination was neither requested nor ordered and no investigation was held.

(To be concluded in July issue.)

CLINICAL-PATHOLOGICAL CONFERENCE

MINNEAPOLIS GENERAL HOSPITAL

J. B. Arey, M.D., and D. H. Taylor, M.D., Pathologists

Presentation of a Case

DR. EICHHORN: This is the case of a twenty-year-old white man who was admitted to the Minneapolis General Hospital on January 26, 1944. Three months prior to admission he had developed persistent pain in his left shoulder. This was aggravated by motion, at times by deep breathing, and was occasionally accompanied by night sweats, fever and generalized malaise. Three days prior to admission he noted pain, heat and swelling of the left fourth toe, and on the day of admission tenderness was noted in the left ankle.

Past history revealed that the patient had been hospitalized at the age of eleven years because of multiple joint pains, anorexia and progressive fatigue of two months' duration. Physical examination at that time revealed a systolic murmur at the apex, and x-rays were interpreted as showing a mitral type of configuration of the heart. Although it was recommended that he restrict his activities, this advice had apparently not been followed.

Physical examination on his last admission to the hospital revealed a temperature of 104, pulse 120 and blood pressure 174/70. The heart was enlarged to the left on percussion, the rhythm was regular. There was a blowing, high-pitched diastolic murmur audible in the second right interspace, transmitted down along the left sternal border. There was a systolic murmur over both aortic and mitral areas; no diastolic murmur was audible over the mitral area. Duroziez sign was positive, and a capillary pulse was present. The left fourth toe was slightly swollen, red and tender. The left knee was tender but did not appear red or swollen. The remainder of the physical examination was essentially negative.

Laboratory examination revealed the following pertinent findings: The serology was negative, hemoglobin 73 per cent, white blood count 12,700 with 86 per cent neutrophiles. The specific gravity of the urine was 1.026; a trace of albumin and occasional pus cells were present. The sedimentation rate was 81 mm. in one hour.

The patient was treated with salicylates, following which the joint pain was immediately relieved. However, his temperature continued to range betweeen 99 and 104. On the fifth hospital day he complained of pain under the left lower ribs anteriorly lasting about three hours. This pain disappeared, only to recur the following day. At this time there was some tenderness and rigidity in the left upper quadrant, but no rebound tenderness was present and no friction rub was audible. Examination of the remainder of the abdomen was essentially negative, the bowel sounds being normal.

The following morning the patient became nauseated and vomited. There was now generalized abdominal tenderness, with some distention and rebound tenderness. The bowel sounds were absent.

The stools were negative for occult blood, and repeated peritoneal aspirations in the left upper and right lower quadrants failed to reveal free fluid. Rectal examination revealed tenderness in the cul-de-sac and in both lower quadrants, but no masses were palpable. His temperature now ranged between 102 and 103 degrees, the white blood count was 19,000 with 88 per cent neutrophiles.

Conservative therapy was instituted and duodenal suction applied. In the course of four to five days the patient's temperature dropped, the abdominal distention and rebound tenderness disappeared. There was some residual abdominal tenderness present for some time. The differential diagnoses considered were generalized peritonitis of a nonspecific type, such as is said to occur with rheumatic infections, mesenteric embolus and rupture of a splenic abscess.

During the aforementioned abdominal episode, three blood cultures were reported as positive for streptococcus viridans. On February 17, 1944, large doses of sulfadiazine were started and hyperthermia therapy was attempted, but the latter was not tolerated. The blood sulfadiazine level was maintained between 30 and 55, but his temperature continued to range between 103 and 104 degrees.

One month after admission, on February 26, 1944, the patient developed headache in the left frontal region. The following morning he complained of weakness of the left arm and leg with paresis of the left side of the face. Neurological examination now showed a sustained ankle clonus on the left, with increased deep reflexes in the left arm. Babinski sign was negative, and no sensory disturbances were noted. Following this cerebral episode the patient's course was progressively downhill. No petechial hemorrhages were noted at any time. Occasional urinalyses showed 18 to 20 red blood cells. The hemoglobin gradually dropped to 40 per cent, the white blood count ranged between 7,000 and 14,000. Another blood culture taken on March 29, 1944, was positive for streptococcus viridans. His temperature continued to rise to 103 and 104 degrees. On the evening of April 5 he suddenly developed marked dyspnea and cyanosis, became comatose, and died within a period of one and one-half hours. No cough or chest pain was noted during this final episode.

DR. KAPLAN: Here is an x-ray of the chest taken shortly after admission. The configuration of the heart

in no way suggests mitral disease. The decided left ventricular prominence suggests instead an aortic lesion. The pulmonary conus is normal; there is no pulmonary congestion.

This is the first film of the abdomen taken during the abdominal episode. There is a rather marked gastrectasia and dilation of several loops of small bowel. In addition, a small amount of gas is present in the large bowel. Because of the absence of dilation of the large bowel the picture is not characteristic of a generalized ileus such as is usually encountered with generalized peritonitis. This would tend to favor a partial or incomplete obstruction or a localized ileus of the small bowel.

DR. AREY: In summary, this patient undoubtedly had a subacute bacterial endocarditis, probably on the aortic valve. Approximately two months before his death he developed an acute abdominal episode with the clinical signs of a generalized peritonitis. He apparently recovered from this under conservative therapy, but his endocarditis persisted. About one month prior to his death he showed signs of a cerebral accident, presumably on the basis of an embolic lesion. His death was characterized by the sudden onset of coma, dyspnea and cyanosis, with, as far as could be determined, no neurological findings and no chest pain.

Several explanations can be offered for his sudden death. In the first place the presence of subacute bacterial endocarditis is alone sufficient to cause sudden death. With an aortic lesion, a bacterial vegetation might become impacted in the coronary orifice. Other possibilities include rupture of a mycotic aneurysm, coronary embolism and cerebral embolism. With the present findings it is doubtful if an exact cause of the sudden death can be given.

DR. KAPLAN: What about the possibility of a pulmonary embolism? The patient was bedridden and might easily have developed venous thrombi in the lower extremities.

DR. AREY: This also should be considered as one possibility.

Autopsy

DR. EICHHORN: The right pleural cavity contained about 1,000 c.c. and the left 700 c.c. of clear straw-colored fluid. The peracardial sac contained about 300 c.c. of similar fluid. The serous surfaces of the pleural and pericardial cavities were smooth and shiny. The heart weighed 520 grams. The left ventricle was markedly hypertophied and somewhat dilated; there was a lesser degree of right ventricular hypertrophy and dilation. On the posterior cusp of the aortic valve was a large friable vegetation 2x1x1 cm. This vegetation extended downwards onto the surface of the anterior mitral leaflets and on section a small aneurysm, about 6 mm. in diameter, passed from the inferior surface of the base of the posterior aortic cusp to a point 2 mm. from the inner surface of the left auricle. This latter aneurysm was directly continuous with the aortic vegetation, and was filled with friable material similar to that of the vegetation. It did not communicate with the sinus of valsalva. The other two aortic cusps contained small friable brownish vegetations and appeared somewhat thickened. There was a small linear rent in the left aortic cusp, surrounded by the aforementioned vegetation. The mitral valve was thickened and fibrous, contained small vegetations, some of which resembled those on the right and left aortic cusps. Other vegetations on the mitral valve more closely resembled fresh rheumatic lesions. The tricuspid and pulmonary valves were free from change. Both coronary orifices were patent. In the left coronary artery there was an occlusive mass, resembling the large aortic vegetation, beginning just proximal to the origin of the circumflex branch and extending for a distance of 1 cm. down the anterior descending branch. This mass was easily removed from the coronary artery, leaving a smooth surface free from atherosclerosis. The remainder of the coronary arteries were free from change. Immediately beneath the endocardial surface of the left ventricle were numerous pin-head sized abscesses. On section the myocardium showed a few minute areas of fibrosis, but no gross infarcts.

The right lung weighed 880 grams, the left 510 grams. The pulmonary arteries were free from emboli, and on section the lungs showed only some congestion and edema.

No free fluid was noted upon first opening the peritoneal cavity. Further examination revealed three large abscesses, all well walled off and distinct from another. One of these measured 5x6x10 cm., and lay at the superior pole of the spleen. This contained about 300 c.c. of thick, creamy, purulent material which was somewhat blood stained. A second and similar abscess, about one-half the size of the former, was located at the lower pole of the spleen. The third abscess occupied the entire minor pelvis and was walled off superiorly by the mesentery. It contained about two liters of purulent material. None of these abscess cavities communicated with the general peritoneal cavity.

The entire gastro-intestinal tract, including the appendix, appeared normal. The spleen (with small portions of the walls of the adjacent abscesses) weighed 500 grams. At both poles were large abscesses within the substance, measuring three to four centimeters in diameter. These were directly continuous with the larger abscesses at either pole of the spleen. In the remaining splenic substance were multiple red and yellow infarcts, as well as several small abscesses.

The liver weighed 1700 grams and showed definite darkening of the centers of the lobules. The right kidney weighed 170 grams, the left 200 grams. No petechial hemorrhages were noted on the surfaces, and except for one old infarct on the right, the organs showed no significant change. There was no permission granted for examination of the head.

DR. AREY: The abdominal episode which was noted is best explained as a generalized peritonitis subsequent to rupture of a splenic abscess, undoubtedly a suppurative infarct. In time the purulent material localized and became walled off, forming the three abscesses

located at postmortem examination. Although the brain was not examined at postmortem, I believe we are justified in attributing his sudden death to a coronary embolism.

Microscopic Findings

DR. AREY: This is a section of the vegetation on the posterior aortic cusp. Notice the clumps of bluish-staining material, some of which represent calcium and some bacteria. The valve proper is thickened and fibrous, and in addition shows an acute valvulitis. This is the area of the aneurysm extending almost to the left auricle. It is filled with neutrophiles and thrombotic material similar to that in the vegetation. Notice the very short distance separating it from the endocardial surface of the left auricle.

Here is a section of the anterior descending branch of the left coronary artery just distal to its origin. The wall shows no evidence of atherosclerosis or arteritis. The lumen is filled with material identical with the vegetation on the aortic cusp. Large clumps of calcium and bacteria are present in the embolus, but none are present in the wall of the artery.

This section is of the spleen taken at one pole. Notice the accumulations of neutrophiles, both within the substance and in the abscess, about the spleen. In addition, there are areas of infarction and acute splenitis.

Section of the kidney shows one glomerulus with a fibrous type of focal embolic glomerulonephritis. In addition, there is considerable proliferation of the glomerular endothelium. Although this is quite definite, it is probably better interpreted as a subclinical acute glomerulitis, rather than an actual clinical acute glomerulonephritis.

Sections of the myocardium show Aschoff bodies, areas of fibrosis and abscesses ("Bracht-Wachter Bodies"). About the latter there is some necrosis of the muscle cells.

Discussion

DR. AREY: Although coronary embolism is probably of more interest pathologically than clinically, as with all other conditions, it will not be diagnosed unless it is kept in mind. Accordingly, I would like to briefly review some of the salient features concerning this condition.

The first recorded case of coronary embolism was that described by Virchow in 1856. In 1933, Saphir reviewed the literature on coronary embolism. Only eleven of the reported cases were accepted by them as proven cases. To this number he added three case reports of his own. In 1940, Porter and Vaughan reported three cases of coronary embolism, all associated with syphilitic aortitis. They reviewed the literature on this subject, accepted seven cases which Saphir had rejected, and brought the total number of collected cases to thirty. In 1941, Hamman reviewed forty cases of coronary embolism, ten of these being from the Johns Hopkins Hospital, the remaining thirty being gathered by a brief and admittedly incomplete review of the literature. Although the criteria used by Hamman often appear inadequate to justify the diagnosis of coronary embolism, the fact remains that this is definitely a rare condition.

The site of origin of a coronary embolus may be any of six different locations. Forty per cent of coronary emboli arise from acute or subacute bacterial vegetations on the aortic or mitral valves. Probably the next most common point of origin is a thrombus covering either an atherosclerotic ulcer or an area of syphilitic aortitis in the root of the aorta. Thrombi in the left auricle or ventricle may rarely result in a coronary embolism. Another reported source of coronary emboli is a partially occluding coronary thrombosis or an atherosclerotic plaque in a coronary artery. Either of these may become detached from the wall of the coronary artery, pass to a point distal to their origin, and result in coronary embolism. Pulmonary vein thrombi are reported as occasionally resulting in coronary embolism, but to date I have found no case in which such a source was proven. Lastly, paradoxical emboli arising in the peripheral veins and passing through a patent foramen ovale may give rise to coronary embolism.

The symptoms of coronary embolism are those of an acute coronary occlusion, and the diagnosis can rarely, if ever, be more than suggested as a possibility. As a rule death occurs suddenly. In patients dying suddenly with previous evidence of bacterial endocarditis, such a possibility may be suggested, but as a rule some other complication will be the responsible factor. In patients having signs of paradoxical emboli, coronary embolism may also be suggested as the cause of sudden death, but pulmonary embolism is a far more common finding. In cases of coronary embolism arising from any of the other sources, it is doubtful if the diagnosis can be made.

The above discussion has referred only to those cases of coronary embolism in which one of the larger coronary arteries is occluded. In addition, the results of multiple emboli in the small branches of the coronary arteries may be briefly mentioned. Such smaller multiple emboli are not infrequent in cases of bacterial endocarditis. De Navasquez collected twenty cases of bacterial endocarditis due to streptococcus viridans and found myocardial lesions were present in nineteen of these. He believed all the myocardial lesions could be explained on the basis of minute emboli to the small branches of the coronary arteries.

Saphir found emboli in the small branches of the coronary arteries in eighteen of thirty-five cases of subacute bacterial endocarditis, but in only one of these was an embolus noted grossly. In twenty-eight of the thirty-five cases, minute infarcts of varying ages were found.

Summary

A case of subacute bacterial endocarditis is reported. This was complicated by suppurative splenic infarcts with peritonitis and multiple peritoneal abscesses. Other embolic phenomena included a coronary embolism, which was the immediate cause of death. A brief summary of the literature on coronary embolism is given.

Diagnoses: (1) Subacute bacterial endocarditis, aortic and mitral valves; (2) coronary embolism; (3) perforation of left aortic cusp; (4) myocardial abscesses and fibrosis; (5) suppurative splenic infarcts; (6) multiple peritoneal abscesses; (7) infarct of kidney; (8) focal embolic glomerulonephritis; (9) chronic passive congestion of liver; (10) bilateral hydrothorax; (11) hydropericardium.

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CLINICAL-PATHOLOGICAL CONFERENCE

ST. LUKE'S HOSPITAL—DULUTH

Arthur H. Wells, M.D., Pathologist

Presentation of a Case

DR. F. E. HILL: This seventy-three-year-old white man was admitted to the hospital six days before his death with a history of having been subject to attacks of tachycardia for the past eighteen years. Seven years ago he visited the Mayo Clinic where it is said he learned to stop attacks of tachycardia by pressing over the carotid region. At that time his blood pressure was 100/60 and one year later it was 190/120. About one year ago he had an attack associated with edema of the legs at which time he was confined to bed for four or five weeks and was given digitalis. For the past three days he has noticed increased difficulty with breathing, particularly on climbing stairs. He had not slept for two nights and the night before admission he slept sitting up in a chair which seemed to improve his breathing. The carotid pressure failed to improve his cardiac condition on this occasion. When first seen by me his pulse was 168 and irregular. The blood pressure was 120/80. There was a grayish pallor and cyanosis. Rales were heard in the chest with noisy breathing. A high-pitched murmur was heard in the aortic, pulmonic, and tricuspid areas transmitted to the vessels in the left side of the neck and into the left axilla. There was no edema of the extremities. His heart tones were feeble, pulse weak and heart rate increased. X-ray examination revealed cardiac enlargement, pulmonary congestion, right pleural effusion and possible pneumonia in lower portion of right lung. There was conspicuous nausea and vomiting after admission to the hospital. The patient was rapidly digitalized during this period. His temperature gradually rose to 105° during his last three days. There was some retention of urine in the urinary bladder requiring catheterization. In spite of digitalis, aminophyllin, coramine, dilaudid, et cetera, he showed very little evidence of improvement at any time.

Clinical Diagnoses

DR. D. C. DOUGHTRY: Coronary sclerosis with chronic congestive heart failure.

DR. A. T. LAIRD: Calcified aortic valvular disease with chronic congestive heart failure.

Autopsy Findings

DR. A. H. WELLS: Both clinical diagnoses given are correct but they do not include what I consider the most important disease process leading to this patient's death. This was a huge atheromatous plaque at the orifice of the right renal artery which appeared to completely block its lumen. There must have been a tiny opening which I could not demonstrate because the right kidney was uniformly atrophied throughout to a weight of 100 grams, and had an unusually dark, faintly stippled outer surface. The left kidney appeared entirely normal excepting that it was hypertrophied to a weight of 270 grams. Its renal artery had only mild atherosclerotic changes. A severe hypertrophy of the left ventricle of the heart predominantly accounted for its weight of 610 grams. There was a mild hypertrophy of the left ventricle and a grade II dilatation of all four cardiac cavities. The aortic leaflets had a severe fibrosis with many calcified nodules scattered over their surfaces with fusion of two leaflet margins so that there was an estimated grade II insufficiency and stenosis. There was a grade I nodular fibrosis of the contact margins of the mitral leaflet with slight thickening of chordæ tendineæ and no apparent insufficiency. There was also a moderate arteriosclerosis of coronary arteries with a grade II narrowing of their lumina. The myocardium was quite hypertrophied, firm, slightly pale and completely free from fibrosis. Secondary findings were those of chronic congestive heart failure with bilateral hydrothorax, ascites, slight peripheral edema, and chronic passive congestion of the lungs, liver and spleen.

Microscopic Study.—The sections from the right kidney revealed numerous completely scarred glomeruli and rather severe atrophy or decrease in size of tubular structures throughout the sections. There is no thickening of arteriolar walls and only a grade II sclerosis of the arcuate and intralobular arteries. The left kidney has some diffuse but mild dilatation of tubules and no evidence of vascular degeneration of any type. The glomeruli tend to be rather large and congested.

I feel that we have a typical "Goldblatt kidney" which is the probable explanation of this patient's past history of hypertension and the most important cause for his chronic congestive heart failure and death. Undoubtedly the aortic valvular deformity with the insufficiency and stenosis and the coronary sclerosis as well as the auricular fibrillation played important roles in handicapping the heart.

This case has been presented because of the current interest in the means of clinical demonstration of this rare condition and its surgical cure through unilateral nephrectomy. There can't be much doubt any longer that there is a human counterpart for the experimental hypertension produced in animals by clamping the main

(Continued on Page 495)

PEDIATRIC-PATHOLOGICAL CONFERENCE

DULUTH PEDIATRIC SOCIETY
O. W. Rowe, President

ST. LUKE'S HOSPITAL
Arthur H. Wells, Pathologist

Bilateral Adrenal Hemorrhages with Waterhouse-Friederichsen Syndrome

C. H. Schroder, M.D. and Arthur H. Wells, M.D.

DR. C. H. SCHRODER: This four-year-old boy, Andrew P., was admitted to St. Luke's Hospital because of fever, cyanosis and delirium.

He had been in the hospital twice previously, once for follicular tonsillitis and otitis media and a second time for roseola infantum. He also had had measles and chicken pox. He had been immunized to small pox, pertussis and diphtheria. His mother and older brother were living and well. His father, a farmer, was also in the hospital at this time with undulant fever.

The patient had an influenza-like infection for about ten days before admission, during which time he had considerable fever but did not seem seriously ill. His mother had given him aspirin rather freely during this period. On the evening before the day of his death his condition suddenly became much worse. At 11:00 P. M. that night he awoke with a severe pain in the abdomen and there was a sharp rise in his fever. He was given more aspirin and he worried through the night with difficulty. In the morning he vomited and had several loose stools. After consulting me by telephone, for the first time, the mother brought him immediately to the hospital. On the way he became irrational.

He was examined immediately upon admission, about 10:00 A. M. He was a very sick appearing boy, aged four and one-half years. His fingers were slightly cyanotic and the extremities were cold, although his temperature was 105°. He was delirious in a muttering sort of way. There was no retraction of the head but the neck was a little rigid. The pupils were equal and reacted to light. The fauces were hyperemic. There were a few infected crypts in the right tonsil. There was a slight lag in the left thorax and on the right side the breath sounds were slightly exaggerated. Over the left upper lobe the expiration was prolonged and the sounds were somewhat tubular but true bronchial breathing was not heard. The relaxed, sunken abdomen gave no evidence of tumor masses or other abnormality. A doubtfully positive Kernig reflex was noticed but there was no exaggeration of the patellar reflexes. X-ray studies of the lungs revealed some slight evidence of bronchopneumonia. The white blood count was 12,400, the red count 4,260,000, the hemoglobin 11.5 grams, the differential count, neutrophiles 33 per cent and lymphocytes 64 per cent. The spinal fluid contained no white blood cells.

Because of the cyanosis it was necessary to keep him in an oxygen tent. He was given 250 c.c. of salt solution, with 5 per cent glucose, subcutaneously. External heat was applied and sulfathiazole therapy was started. The clinical diagnosis of pneumonia or meningitis was entertained. However, the unusual prostration was a confusing symptom. By mid-afternoon he broke out with a distinct purpuric rash which spread quickly over the face, chest, back, abdomen and extremities. The spots were dark red to purplish in color and varied from a pin-point size to blotches 10 to 15 cm. in diameter. There was some muscular twitching and moderate rigidity from the time of admission. He continued to be restless and irrational and when seen again at 6:00 P. M. a lumbar puncture was performed. While this was being done he had a very profuse, foul, yellowish, watery stool, which showed no microscopic blood. As stated above, the spinal fluid was normal. A blood culture taken at this time remained sterile for 3 weeks in both aërobic and anaërobic media. No pathogenic gram-negative bacilli were isolated from stool cultures.

The child rested somewhat more quietly after the puncture. However, there continued to be some muscular twitching and moderate rigidity. About 8:00 P.M. he vomited 75 c.c. of brownish fluid. His pulse, immediately thereafter, became very weak and irregular. External heat was renewed and a second hypodermoclysis was started while we prepared for a transfusion. Before this could be accomplished, however, the child expired. This was about 9:45 P.M.

Autopsy Findings

DR. A. H. WELLS: With the exception of mild toxic changes in the myocardium, liver, spleen and kidneys, the only postmortem findings of importance were in the adrenal glands. Each adrenal was approximately thrice its average size. There were small hemorrhages throughout the cortical tissue. There was no bleeding into the surrounding tissues and no important pocketing of blood in any part of the glands. There was no injection or purulent matter in the meninges. Postmortem blood cultures were sterile and agglutination tests for undulant fever were negative.

Microscopic study: Approximately 90 per cent of the cortical cells of each adrenal gland were completely destroyed or extensively degenerated. The few scattered remaining cortical cells, generally near the periphery,

showed considerable degenerative change. There was rather extensive hemorrhage throughout the cortical area and much blood pigment in this region. Blood vessels throughout the cortex were severely congested so that in places it was difficult to determine how many of the red cells present were confined within the greatly dilated capillary walls. Only rarely could neutrophilic infiltration be demonstrated. Special stains failed to reveal bacteria. The medullary portion of the adrenals was almost completely spared except for mild evidence of toxic change in the form of vacuolization and irregular staining. There was no hemorrhage of significance in the medullary area. The disease process was remarkably selective of cortical tissue. No significant change, such as thrombosis, could be found in the larger vessels in any part of the adrenal glands.

DR. C. H. SCHRODER: In retrospect it may be seen that this boy followed a typical course of the Waterhouse-Friederichsen syndrome, with severe pain in the abdomen, high fever, vomiting, diarrhea, severe prostration, delirium, cyanosis, a rapidly developing purpuric rash, muscular twitchings and rigidity, leading to death within twenty-four hours of the onset of the serious symptomatology. The differential diagnosis included pneumonia, meningitis, and the clinical concept known as Henoch's purpura variety fulminans. It is my opinion that this syndrome is identical with the Waterhouse-Friederichsen syndrome. In this connection I would like to call attention to a very similar case report by Mary Percy Jackson in the *British Medical Journal*, January, 1943.

A variety of well recognized inflammatory processes have been found to be the apparent cause of adrenal hemorrhage, including those due to the meningococcus, hemolytic streptococcus, M. Friedlander, colon bacillus and very likely the virus of influenza. In our patient this virus was very likely the basic cause, as it seemed to be in Jackson's case, mentioned above. We were unable to establish any relation to undulant fever.

It should be noted that there are only a few over 100 cases of adrenal hemorrhage reported in the literature and 90 per cent of these occurred under the age of nine years and 70 per cent under the age of two years. The disease is almost 100 per cent fatal. Had we recognized the true pathology in our patient, we could have added cortin, desoxycorticosterone and ephedrine to the therapeutic measures used.

DR. C. O. KOHLBRY: One must add to the group of causes of adrenal hemorrhage already mentioned those factors associated wtih adrenal hemorrhage in the newborn. These have been divided by Goldzieher and Gordon (*Endocrinology*, March, 1932) into three groups. In the first group are those related to labor in which birth trauma, asphyxia and trauma due to artificial respiration are the principal factors. The normal physiological involution of the adrenals which occurs in all infants beginning shortly before or after birth is in the second group. Here there is a spontaneous degeneration of the inner portion of the cortical cells in an extremely vascular area making this organ a likely site for hemorrhage during this period of life. The last etiologic factor is hemorrhagic disease of the newborn. I do not know that this condition has ever been proved.

The symptoms and signs of adrenal hemorrhage in the newborn are practically identical to those found in the older child or adult with acute adrenal destruction They may be divided into two groups, those depending upon the acute suprarenal insufficiency and those resulting from loss of blood from the circulatory system. In the first instance, one expects rapid respiration, fever, cyanosis, apathy, dyspnea, purpuric rash, muscular twitchings, convulsions stupor, coma and death generally within twenty-four to forty-eight hours. Symptoms frequently attributed to the loss of blood are shock, collapse, cold extremities, increasing pallor, air hunger, abdominal pain, boggy distention of abdomen and at times a palpable tumor in one or both kidney regions.

In 1933, I found six cases of adrenal hemorrhage in the newborn in the records of the Duluth hospitals and in all six fatal cases proved at autopsy the clinical manifestations were essentially those that I have mentioned, with minor exceptions.

DR. A. H. WELLS: I would like to add one additional possible cause of this patient's adrenal hemorrhages and that is a hemorrhagic diathesis resulting from aspirin therapy. Your attention is called to the recent work being done at the University of Wisconsin by C. F. Huebner, O. O. Meyer and co-workers on the production of hypoprothrombinemia resulting from salicylates.

The laboratory findings incident to adrenal hemorrhage may be the result of either acute cortical failure or internal hemorrhage. The first consists of a low grade leukocytosis, hypoglycemia, and at times nitrogen retention due to an associated kidney failure. In experimental work the life of adrenalectomized animals may be greatly prolonged by glucose therapy. Hypoglycemia may be the immediate cause of death in many of the human cases of adrenal hemorrhage. The internal hemorrhage may be sufficient to be an important factor in death and therefore laboratory studies would undoubtedly reveal an increased proportion of serum to red blood cells in these patients.

The central part played by infection has been demonstrated again and again. In the Victorian age, for example, tuberculosis of the lung was relatively common among the well-to-do. This is not surprising when one remembers that the method of medical care was to shut up the unfortunate sufferer in a room with closed windows and a roaring fire and then bring in friends and relatives to watch a beautiful deathbed scene. Those who still remember "Uncle Tom's Cabin" and "Little Women" are not likely to forget good clinical demonstrations given unconsciously in these books. The introduction of fresh-air treatment for this disease had sometimes been regarded as the essential cause of improvement but it is clear that the reduction of the risks of infection played a larger part.—JAMES MACKINTOSH, M.D., New Jersey *Public Health News*, December, 1943.

PIONEER PHYSICIANS OF FARIBAULT COUNTY

ROSCOE C. HUNT, M.D.
Fairmont, Minnesota

RECORDS of physicians in Faribault County before and during the Civil War are very meager. These were the first years of the settlement of this section and doctors, like others, were unstable; they came and went. Therefore, the only records of value up to 1866 are the professional cards and notices. Files of papers are scarce and incomplete but some have been found and these records are conclusive as far as they go.

Information concerning the years following the Civil War is obtainable from those still living. In some cases information is profuse, and that of special value and interest has been selected. Many incidents and characteristics connected with some of the doctors are told. Some are dramatic, some tragic, some amusing, and there are also some indicating the frailities, such as drug addiction and liquor use, from which physicians are not immune. However, the great majority of stories that have been handed down to us show that these men were leaders in the community, had qualities of faithfulness, marked skill and resourcefulness and were men of unquestioned honor in all respects. Some had very meager education and yet by their unfailing loyalty to the community did a great deal of good and were loved and respected. All had constitutions of iron; they had to or they couldn't have survived.

Nehemiah A. Hunt

Nehemiah A. Hunt was born September 27, 1811, in Mason, New Hampshire, son of David Hunt of the Concord Line of Hunts. Influenced by missionaries, when twenty-three years of age he went out to Ohio and entered Oberlin in 1834, one of the first students. He then attended a branch school at Abbeyville. Later he met Clarissa Conrad, a nurse, and they decided to go to India, he was a medical missionary. He then completed a medical course at "Jacksonville Medical College" and then a short theological course. They were married in 1844. Plans for the missionary work were interrupted, and never consummated. He practiced in several towns in Ohio and in the '50's located in Bond County, southern Illinois, where he practiced until moving to Minnesota.

As the Civil War started, southern Illinois was favorable to the South, and the strong abolition opinions of Doctor Hunt were very unpopular. He, in fact, was threatened, and his family were in a constant state of fear for his safety, so in the late summer of 1861 they started by ox team and covered wagons for Minnesota where his wife's brother, Jacob Conrad, had gone the year before. The trip took about a year because of delay by sickness, floods, et cetera, and they arrived in the fall of 1862. The next spring he took a claim in southern Blue Earth County where he made his home until the late '80's. He practiced actively during the '60's, usually going out on a circuit at regular intervals. He was gone for two to three weeks at a time and went where he was directed from one settler's house to another. While he was gone his wife helped when she

could, conducted many deliveries and cared for the sick often in her own home. There was no money in the war days and afterward, and extreme poverty was the condition throughout the prairie country. Doctor Hunt always rode horseback. After about twelve years' practice he found the trips too hard and some other younger doctors had come into the surrounding towns so he quit practice and took up missionary work and the establishment of Sunday schools and churches. His work ended in Minnesota in the early '90's when he completed a pastorate in a church that he had established in Mapleton. He spent the rest of his life in California where several of his children lived. He died there in 1897 at the age of eighty-six.

There were eight children. Three sons were ministers, two physicians, one daughter married a minister and one a physician. There were two grandsons and two great-grandsons who became physicians.

Thomas Sylvester Fellows

Thomas Sylvester Fellows was born in New Hampshire September 4, 1827. His early life was spent in New England where he had his early education. He graduated from the Medical School of Harvard University in the class of 1852. He knew well Dr. Oliver Wendell Holmes, who was Dean of the school during the time Fellows was there.

In 1862 he came out West and settled in Walnut Grove township, Faribault County. While there he experienced the trials of several Indian uprisings and the hardships of the early physicians. In 1870 he moved to Wells, where he practiced until 1893. In that year he found that his health would no longer stand the rigors and hardships of the Minnesota winters and he moved to Floral City, Florida, where he practiced and remained until his death.

He was united in marriage to Miss Flora E. Waterbury, August 8, 1850. She died in Wells, January 7, 1891.

Compared with many early physicians Doctor Fellows had a fine education and was noted as a fine practitioner. He is said to have been of a very kind disposition, and the communities where he spent his life thought much of him.

Doctor Fellows died at his home in Floral City, Florida, July 1, 1902, after a week's illness. His body was returned to Wells for interment. The funeral was held at the Church of the Nativity, Rev. Mapson officiating. The services at the Rose Hill Cemetery were in charge of the Masonic Lodge, of which he had been a member for many years.[6,9,41]

George D. Winch

George D. Winch was born in the State of Maine in 1835. Some years later his family moved to Wisconsin and settled near Columbus. He graduated from Rush Medical School in 1860. He was a surgeon throughout the Civil War in the 42nd Wisconsin Regiment which was a part of Grant's Army, and was in the Vicksburg siege. In 1865, upon his discharge, he came to Blue Earth City where he practiced twelve years. There is a notice of his being there in a copy of the *Blue Earth City Advocate* of 1866.

It seems that every settlement of the early day had one physician, who for one or more characteristics was notorious. The one qualified for this distinction in Faribault could be no other than Dr. George Winch. His activities and eccentricities have become legendary in the community. He is described, and there are still those who recall him well, as a dashing impulsive character, as a hard worker who did things in a spectacular manner and died the way he lived.

A good many incidents are told about him. He had reportedly been one of

the chief surgeons to Gen. Grant's Army and had done about all the surgery that was performed in those days, so he probably did the many amputations attributed to him. A number of men started to study under him, and there is one notice of "Drs. Winch and Peck" in an issue of *Minnesota Southwest* in 1867.

Benjamin Way was returning from his army service and while walking near Redwood Falls was caught in a blizzard and froze both feet and hands. Doctor Winch was sent for and left immediately, traveling by horses and sleigh. It took him two days to reach the man and he then brought him back to Blue Earth City. After a few days he amputated all four members, and Way lived a good many years afterward.

He was a well known character about the southern part of the state. For winter use the doctor built a covered box on top of runners. He had a cot in it and a stove. The driver went along and the doctor slept. When a storm overtook, the team was unhitched, tied to the box and they waited until they could go on.

When Doctor Winch came to Blue Earth City he had little money. He succeeded in borrowing $1,200 from one of the only well-to-do farmers in the county, J. D. Stanton. He had a claim on the river south of Blue Earth City. In the succeeding years the doctor always stopped at the Stanton farm when in the neighborhood and ate and visited. He also did some few things professionally for Mrs. Stanton, though she had never been seriously sick. After six or seven years had gone by and the doctor had offered no remuneration for the shelter and food he had received, Mr. Stanton one day asked him if he could not make some payment. Doctor Winch said, "I also have thought we should have a settlement." Reaching into his pocket, he pulled out a worn slip of paper on which was written, "To services Mrs. Stanton—$2,700." Mr. Stanton paid the difference.

It is stated by those who still remember, that Doctor Winch was an opium addict and had acquired the habit while in the army. It is also of record that a number of his patients became addicts. If there was any excuse for him it might be made because of the hard army life and the long drives, loss of sleep and hard work that he experienced in his practice. Also it may be said that where patients could not be seen often, it was undoubtedly necessary to leave with them medicine for long periods and for pain opium probably was required.

Upon the organization of the State Board of Health, Doctor Winch was appointed as a member, June 11, 1872.

In addition to the sleigh, Doctor Winch built a bath tub in his house which was a special comfort to him in the heat of the summers. It was said to have been the first, and the only one for many years, in the community. On the late evening of July 7, 1877, at the age of forty-two, he returned from a long hot drive and a hard day's work. As was his custom, he got into a tub of cold water to cool off and there he died about midnight. Some say he had too much liquor, some that he died of morphine poisoning, but Dr. A. J. Franklin who arrived at the time he died stated that it was from an overdose of chloral hydrate. Mass was said by Father Venn in the Blue Earth City Catholic church. A tin casket was made by the local tinner. The body was packed in ice and sent to his old home at Columbus, Wisconsin. There services were held in the Presbyterian church, of which the family were members.

There is real doubt as to whether Doctor Winch merited all the laudation he received. There were undoubtedly other early day physicians of as good, if not better, training, and probably as good practitioners. Certainly, his army back-

ground accentuated his dramatic notoriety; and he was a real showman twenty-four hours of the day. Some people cultivate eccentricities and he was one of these. His death brought forth a poem from the pen of the so-called "Poet Laureate of the West," Charles Freer. It may not go down in history with Longfellow's poems, yet to the simple people of the West it was a masterpiece, and it occupied the front page of the *Blue Earth City Post*.[2,7,8,9,10,14,15,16,19,29,36,37]

John P. Humes

John P. Humes was born January 16, 1837, in Crawford County, Pennsylvania, son of John C. and Mary E. (Griffin) Humes. His parents were natives of Pennsylvania and of Scottish descent. His boyhood days were spent on the home farm and he attended several academies. He taught school several years. In 1856, he came to Illinois where he again taught school a year. The next year, 1857, he moved to Faribault County, Minnesota, and filed on a quarter section of land east of Winnebago City. For four years he lived in a shanty and worked up the land.

In May, 1861, he returned to Pennsylvania and worked with his brother in a barrel factory for three years, during which time he spent his spare time studying medicine from books loaned him by a physician. In 1864, he returned to Winnebago City and took up medical study in the office of Dr. Alvin Lockwood. In 1866 he started practice for himself. In 1867 after a few months' attendance, he is said to have "completed a course at Rush Medical College."

As a physician he was successful and had a very large territory to cover. At one time he drove a span of Indian ponies on a buckboard, although he rode horseback most of the time in the early years. Like others, he underwent great hardships but he was of a very robust constitution, or he never could have stood them. In addition to maintaining a practice for nearly fifty years, he owned and operated three fine farms. He was a very good businessman and had accumulated these farms and other lands as time went on.

In civic affairs he took an active part. He was mayor of the village and a member of the school board for fifteen years. He was a trustee of Parker College and a financial supporter of it. He was a Republican, an Odd Fellow, a Mason and a member of the Methodist Church.

In 1867 he married Emma McColley and there were five children. He died at his home in Winnebago, March 9, 1908, at the age of seventy-one.

Doctor Humes was a man with a rough exterior but a warm heart, and answered calls from rich and poor, traveling the prairies in all sorts of weather. It is said that during grasshopper times, when the clouds of insects obscured the sun for days and ate up all the crops, he burned his books and did not try to collect any fees.

The *Winnebago Press*, in its edition of April 9, 1875, published the following notice over the signatures of Doctors Slagle and Humes:

"Not withstanding the thinness of our pocket-books and clothing, there has not been a case of acute sickness within five miles of Winnebago within six weeks."[3,4,19,32]

(To be continued in the July issue.)

President's Letter

Excluding Tuberculosis from the Hospitals

The Meeker County project for control of human tuberculosis, sponsored by the Committee on Tuberculosis of the Minnesota State Medical Association, is now on the road to completion.

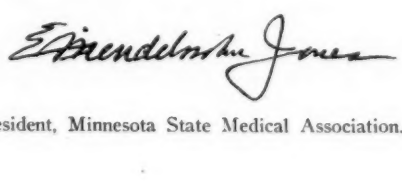
It has stimulated other counties in the state to plan similar surveys of their own, and there is good hope that it may become a model for routine county-by-county discovery and control of tuberculosis throughout the country. It is to the credit of committee members that they are not resting on their Meeker County laurels but are continuing to attack the tuberculosis problem from many angles.

They now have at heart a new search for unsuspected tuberculosis at a point where rich rewards are to be had, not only in tuberculosis case-finding, but in added protection against avoidable risks for an extremely vulnerable section of the population—the patients in general medical and surgical hospitals.

With the exception of a few large institutions, such as the University Hospitals, tuberculosis exclusion tests are not performed as part of routine admittance to these hospitals. Patients with known tuberculosis are not admitted, as a general rule, but it is well known that a considerable percentage of patients admitted for surgery, obstetrics and other non-tuberculous conditions do have unsuspected lesions and their tuberculosis may, and not infrequently does, produce serious unforeseen complications, especially in the case of surgery and obstetrics. Also, patients with unsuspected tuberculosis may constitute a menace to hospital personnel and to their own family contacts.

It is a fact that hospitals provide a concentration of people who are peculiarly amenable to any diagnostic or protective measure which staff authorities and their own physicians may consider advisable. It is probable that very little resistance to the added expense would be encountered from the patients and the procedure, whether it consisted of routine chest x-ray or the tuberculin skin test with x-ray for reactors, or, in favorable instances, fluoroscopy, would soon be accepted, just as blood tests are accepted, as a regular part of hospital routine.

It is true that lack of facilities and personnel may postpone establishment of routine tuberculosis exclusion measures for some time, though the development of miniature film may bring it closer, depending upon release of equipment. But the committee is taking a sound step in the right direction in paving the way, now, for establishment of such routines, as soon as equipment, technicians and staff assistance are available when the war is over.



President, Minnesota State Medical Association.

Editorial

CARL B. DRAKE, M.D., *Editor;* GEORGE EARL, M.D., HENRY L. ULRICH, M.D., *Associate Editors*

PENICILLIN AVAILABLE

THE availability last month of penicillin for civilian practice constitutes a milestone in medical practice. Heretofore, all penicillin production has been allocated for use of the armed services and for centers for clinical research. This procedure was wise. The clinical application of penicillin has been rather thoroughly investigated at a number of medical centers, and the diseases for which it is of value have been determined. This is a much more economical method than for every physician to do his own research.

As the supply of this new drug is still limited, its distribution, for the time being, will be under the control of the Office of Civilian Penicillin Distribution of the War Production Board, 226 West Jackson Boulevard, Chicago. The drug in vials containing 100,000 Oxford units has been sent to about 1,050 hospitals which will act as depots for distribution. Other hospitals will obtain their supply from these depots until the supply warrants the adoption of the usual methods of distribution by the manufacturers. In case it is not obtainable from these depots, application may be made to the central Chicago office.

Each hospital will receive its monthly quota, according to its needs and the available supply. As the supply is limited, physicians and hospitals will have to coöperate in its use. Physicians will have to remember that penicillin is not a cure-all. Its field has been rather definitely determined, and the report prepared by Dr. Chester S. Keefer, chairman of the Committee on Chemotherapy of the National Research Council, is most instructive. Copies of the report, which contains instructions also as to dosage, may be obtained from the Chicago headquarters office.*

It is effective in all infections due to staphylococcus, hemolytic streptococcus, anaerobic streptococcus, pneumococcus, gonococcus and clostridia (gas gangrene). It is useless in all gram-negative bacillary infections (typhoid, dysentery, influenza, undulant fever, tularemia), in tuberculosis, rheumatic fever, infectious mononucleosis, leukemia, ulcerative colitis, malaria, and poliomyelitis. Its value has not been definitely defined in syphilis, bacterial endocarditis, ruptured appendix, and urinary infection.

It should be remembered that while nontoxic, penicillin is rapidly eliminated from the body. It, therefore, must be administered frequently by the intramuscular method or continuously by the intravenous route. While it is of value on local application, oral administration is useless.

*Copies may also be obtained by addressing the Professional Service Department, E. R. Squibb & Sons, 745 Fifth Avenue, New York 22, N. Y.

PREMARITAL AND PRENATAL EXAMINATIONS

THE American Social Hygiene Association has just published a revised edition of a Summary of State Legislation Requiring Premarital and Prenatal Examinations for Venereal Disease. That thirty of our forty-eight states now have laws requiring a physician's certificate of freedom from venereal disease before a marriage license is obtainable and require a blood test for syphilis be taken promptly by the attending physician or midwife on the diagnosis of pregnancy is striking. That Minnesota along with Washington, Montana, and Maryland (that Gretna Green of the East) are the only states above the Mason-Dixon line which have not passed this legislation is noteworthy.

Minnesota can be rather proud of her record in being in the front ranks in the fight against tuberculosis. Her maternal mortality rate has been in the low brackets for several years. Her laws regulating medical practice have placed our state in the front rank. Her smallpox mortality figures in recent years have been embarrassing it is true. Have we not been backward in not passing laws directed towards venereal control?

Thirty out of forty-eight states believe that parties in a marriage contract are entitled to the knowledge that their prospective partner is free from venereal disease; that the babies of the next generation are entitled to start life free from

syphilis. Can these states be wrong? If not, then we in Minnesota have been remiss.

This is a medical subject. Who is in a better position to observe the results of marriage and confinement without the detection of venereal disease than the physicians? It is clearly in the sphere of medicine to sponsor such laws if not medicine's obvious duty.

The premarital examination laws vary in the different states. In all thirty of the states, the laws provide for premarital examinations of both parties for syphilis. In twelve states, the examination covers other venereal diseases, too, and in two of these states, the examination covers various other diseases.

The subject of the provisions of a state law in case syphilis, gonorrhea, or such diseases as tuberculosis are detected in such examinations is open to some difference of opinon. At least ignorance of the existence of one of these diseases would be obviated, and the contracting parties could be informed of the treatment needed. There is a widespread realization of the desirability of a physician's certificate of health on the part of many young people contemplating marriage even in Minnesota, where we do not have the legal requirement. It is time Minnesota stepped into line with the other thirty states which have already passed this legislation.

QUININE SYNTHESIZED

THE discovery of a method of synthesizing quinine by Woodward and Doering constitutes a milestone in chemotherapy.

Quinine is still the most valuable of the drugs used in the treatment of malaria, although quinacrine (U.S.P.), known under the trade name of atabrine is of value.

The use of Peruvian bark in the treatment of malaria dates back to the seventeenth century. For many years, the supply came from South America. The attempts by England and Holland in 1850 to start chinchona plantations in India and Java proved unsuccessful because of the low quinine content of these particular trees. In 1865, however, Leger sold the Dutch Government's cinchona plantation in Java one pound of seeds of a variety of trees which produced a high quinine content. In 1941, the Java trees produced 1,000 tons of quinine, almost the entire world supply. This supply is now, of course, in the hands of the Japanese.

The active alkaloid quinine was first isolated from the bark in 1820 by two French chemists, Pelletier and Carentou. Since that time, efforts to synthetize quinine have been unsuccessful until now.

As far back as 1853, quinotoxin was produced from quinine by Pasteur, and in 1918, Rabe resynthesized quinine from quinotoxin. In 1931, Rabe was able to synthesize dihydroquinine, which, except for two H atoms, is the same as quinine. His work is said to have offered a valuable clue which the two youngsters, Woodward and Doering, followed.

Robert Burns Woodward was born in Quincy, Massachusetts, in 1917. He graduated from the Quincy high school at the age of sixteen, and his head already contained as much knowledge of organic chemistry as most college graduates. He entered the Massachusetts Institute of Technology at the age of sixteen, received his B.S. degree in three years and a Ph.D. in chemistry at the age of twenty, after only four years of college.

William von Eggers Doering, his coworker, was born in Fort Worth, Texas, also in 1917. He prepared for college at the Belmont Hill school at Belmont, a suburb of Boston, entering Harvard in 1934, and receiving a B.A. in 1938. After taking postgraduate work in chemistry at Harvard, he obtained a Ph.D. in chemistry in 1943. The same year, he was employed by Polaroid on a project to synthesize quinine.

The two young scientists met at Harvard in 1942, and shared the honor of having successfully developed a method for synthesizing quinine.

SOLLMANN, THE "DADDY OF PHARMACOLOGY"

OF GENERAL interest is the announcement of the retirement, June 30, of Dr. Torald H. Sollmann, as dean of the School of Medicine and head of the Department of Pharmacology at Western Reserve University, Cleveland, Ohio.

The youngest of nine children, he came to this country from Coburg, Germany, when only thirteen years of age. In four years' time he learned enough about drugs to pass the Ohio State Board examinations in Pharmacology with flying colors, the youngest Ohioan to obtain a druggists's license up to that time. His love of science and industry

led him to take further work in pharmacology abroad. In 1896, he obtained his medical degree. At this time, there was no book on pharmacology in English, and his first text, entitled "Laboratory Experiments in Pharmacology," was a modest forerunner of his "Manual of Pharmacology" which has been the standard text for medical schools in its six editions.

Associated with the faculty of the Western Reserve Medical School for nearly fifty years, Doctor Sollmann became known as the "daddy of pharmacology" and has trained many young men who have become heads of departments at other universities. As a member and subsequently chairman of the Council of Pharmacy and Chemistry of the AMA, which office he will continue to hold, he has rendered valuable service to American medicine.

WASTE PAPER SALVAGE

OUR attention was called recently by the War Production Board to the critical need for waste paper. Hospitals and doctors are urged to take part in the salvage activity by saving all paper which is not greasy or soiled rather than burning it. It is estimated that of the 19 million tons of paper produced in this country yearly, about eight million tons are not suitable for salvage.

The subject of salvage of paper has received considerable publicity recently, and about 680 salvage depots have been established in Minnesota in centers of population of 250 and over with collections at regular intervals. Hospitals and office buildings, as a rule, provide for the salvage of paper for sale to the paper industry. Some allow the Salvation Army to make regular collections. So, as a rule, all the physician has to do is to see that useless waste paper gets into the waste paper basket. It is surprising how much useless paper in the form of old check books, deposit slips, cancelled checks, old receipt books, copies of old letters, can be unearthed from desk drawers and office closets. Most of the periodicals on the doctor's reception room table are suitable material (according to the jokesters), while current magazines should be donated to servicemen's centers.

Every hospital has more or less of a problem in the disposition of old clinical charts. Files are expensive, and floor space has to be considered. Some hospitals are microfilming their charts, and this will be a more general practice in the future when new microfilm machines again become available.

In addition to saving waste paper, it is far better that there be a more universal saving in the use of paper. This applies to physicians, hospitals, medical journals, and last but not least, government agencies.

CLINICAL-PATHOLOGICAL CONFERENCE (DULUTH)

(Continued from Page 485)

renal artery. The question which arises is to what extent should one go to rule out a unilateral kidney disease which might be causing hypertension? Such cases are indeed rare but a few proved cures have been reported. Undoubtedly a thorough study of the functioning ability of each kidney would be essential. A retrograde pyelogram in our present case would have revealed a remarkably small but otherwise normal kidney pelvis on the involved side. Once exposed at the time of surgery I think the gross appearance of the kidney is sufficiently characteristic to be recognizable without exploration of the renal artery. Possibly the opposite kidney should also be visualized at the time of surgery. Besides being a complicated and difficult medical problem there will undoubtedly remain a financial barrier to the proper and necessary studies of many hypertensive patients. Unilateral pyelonephritis, neoplasm or calculus causing hypertension should present less difficult diagnostic and therapeutic problems.

DR. J. R. MANLEYS What is the present status of the recently proposed medical therapy for hypertension?

DR. A. H. WELLS: As you know, Dr. Harry Goldblatt's experiments led to a theory that something was produced in the ischemic kidney which entered the blood stream and caused widespread constriction of arterioles and thus hypertension. This theoretical substance was called renin. Although not chemically identified, "renin" can be isolated from kidney extracts and it will cause hypertension after uniting with something in the blood serum called renin activator. The product of this union has been called vasotonin. Much effort has been expended trying to find something in kidney extracts or other substances which would neutralize either renin, activator or vasotonin. To date Dr. Goldblatt is pessimistic of the chances of finding any such a neutralizing substance. It is also pointed out that if a therapeutic agent of this type is found it will not cure the underlying disease process but like insulin in diabetes mellitus it must be used in measured regular dosages possibly for the remainder of the patient's life.

Anatomical Diagnosis. — (1) Atheromatous plaque stenosis right renal artery; (2) athropy, right kidney; (3) hypertension (Goldblatt kidney); (4) compensatory hypertrophy, left kidney; (5) auricular fibrillation (from history); (6) coronary sclerosis; (7) calcified nodular aortic valvular disease; (8) chronic congestive heart failure.

MEDICAL ECONOMICS

Edited by the Committee on Medical Economics
of the
Minnesota State Medical Association
George Earl, M.D., Chairman

MAYOR LA GUARDIA TAKES A HAND

Among significant signs of the times is the proposal made recently by Mayor LaGuardia for complete medical and hospital service insurance in New York City. The mayor proposes to start the plan with a nucleus of city employes but to open it to any employed person earning $5,000 a year or under. A 4 per cent tax on payrolls, of which employers would pay half, is to finance the plan.

It appears from recent reports that the medical societies of Greater New York have approved the plan in principle but that the doctors have asked, among other things, that participation be limited to people with incomes of $2,500 a year or less. The mayor, on the other hand, is insisting at the present time on the $5,000 income limit because he believes that the people of middle income range, between $2,500 and $5,000, really need the plan most. It is his contention, according to the reports, that the plan will relieve the doctors of much service now performed gratis for people of low income and should therefore justify including the middle income group.

Closed Panel Threat

It has, apparently, not been decided as yet whether the plan will operate with an open panel or a closed panel and the mayor is said to be using the threat of a closed panel to bring doctors into line on the income issue. Naturally, the doctors will not favor any plan which does not open participation to all licensed physicians and give the subscriber free choice of physician. If the doctors do not capitulate to the mayor's proposal for a $5,000 income limit, he is prepared to go ahead, it appears, and hire doctors at salaries from $6,000 to $20,000 a year to provide medical service under the plan. The city would then be divided into zones and the employed physicians would be responsible for all calls within their zones.

"No claim is made for perfection for the plan" the mayor is quoted as saying to the doctors. "We want your ideas, criticism and suggestions for its improvement. But we do not want delay."

At the same time, Mayor LaGuardia is officially on record as approving the Wagner-Murray-Dingell Bill which he has termed the "outstanding legislative proposal before the American Congress." In the event that the bill is enacted by Congress, New York will be "only too happy to turn over its experience to federal administrators and call it a day." Everything must have a beginning, says the mayor.

Insurance Companies Differ

The attitude of insurance companies as reported in the May 4 issues of the *National Underwriter* is also interesting.

"Among the group life insurance companies which are the principal writers of group hospitalization and surgical benefits in the insurance company field," says *The Underwriter*, "the mayor's plan is not viewed with any appreciable alarm. Those who have been studying the whole trend of hospital and medical care insurance and the possibility of its being incorporated into the federal social security plan are inclined to look on the New York City proposal as a step in a desirable direction for they feel that if this type of insurance cannot be made to work successfully on a voluntary and private-enteprise basis, it will inevitably be embodied in federal social security, a course that would be undesirable in many ways."

On the other hand, writers of accident and health insurance policies are said to have received LaGuardia's program with skepticism. Their reaction was that the preventive aspects of the plan as outlined would lead to "a high moral exposure," that is, to great ease of abuse, and that the cost would make most wage earners unrecep-

tive. The actuarial soundness of the plan which provides complete preventive, diagnosis and specialists' services is generally questioned by these companies.

Has Blue Cross Blessing

The plan is said to have the blessing of the Associated Hospital Service, New York's Blue Cross plan, which would supply hospital service under the plan. Louis H. Pink, former superintendent of insurance for the State of New York is head of Associated Hospital Service, now, and is known to have a keen interest in insurance for medical service. It was under Pink's regime as insurance commissioner that several medically-sponsored plans got their start in New York and it was he who issued a sharp warning to the medical societies involved that the insurance department would be obliged to favor changing the law which chartered their activities unless there was more vigorous promotion and wider coverage for their plans. When he accepted the position with the hospitalization group, it was presumably with the idea in mind that he, himself, might eventually have the opportunity to participate in extension of its benefits to cover medical service.

Trial Balloon

It is obvious that medical organizations are not in a position to refuse their participation so long as the cardinal principle of free choice is maintained and subscriber participation is voluntary.

It is obvious, also, that failure of this plan will not discourage Mayor LaGuardia or other backers of such trial balloons. On the contrary they will merely become more insistent upon a compulsory federal plan as the only workable alternative.

SOUND PLANS FOR HEALTH

Physicians who attended the institute for public health administrators at the University Center for Continuation Study last month were impressed by the difference in soundness and worth between the plan for nationwide compulsory sickness insurance embodied in the Wagner-Murray-Dingell Bill and the plan for nationwide distribution of health districts as it was explained by Dr. Haven Emerson, visiting lecturer on public health at the University of Minnesota.

The plan for health districts, as explained by Dr. Emerson, calls for extension of public health units, directed by full-time medical officers of health, to every section of the country. These public health units are to cover districts comprising, usually, more than one county, for economy's sake, and they are to function in accordance with established public health procedures for improvement of sanitation, the control of communicable disease and other recognized health activities. Dr. Emerson, who is professor emeritus in public health of Columbia University, is chairman of the committee of the American Public Health Association which is working out the plan. He and his committee have the backing of the House of Delegates of the American Medical Association as well as other interested agencies of the country.

Unlike many other contemparary planners, these men are dealing with demonstrable needs and they are proposing tested procedures to meet those needs. Their concept of the role of the federal government in promoting the health of the people lies well within the accepted American tradition of local control and local community responsibility. It is clear that their work rates the attention and interest of every physician.

Endorsed by the Delegates

The House of Delegates of the American Medical Association went on record in July, 1942, in favor of medically-directed, full-time public health service all over the United States for the improvement of the national health. The delegates at that time directed trustees of the association to do everything in their power to promote such coverage and the committee of which Dr. Emerson is the head, was appointed with the sanction of the trustees to make necessary studies looking to that end.

At the present time, according to Dr. Emerson, only 40 out of the 130 million people in the United States are living in communities where there is full-time, medically-directed health supervision, and most of these are in the large cities. Public health nurses, if there are any, are working without proper medical direction in many counties and communities and their work, therefore, lacks the effectiveness and coördination it would have under proper direction.

The responsibility for supplying public health organization now lacking for many millions in the United States does not belong to the federal government, in the opinion of the committee, nor

even primarily to the state governments involved. It is the tradition of American life and law that the people, themselves, shall provide essential health as well as police protection and schools for their own communities. States properly set standards, provide supervision and aid in training personnel and they may assist in providing funds, but it is not their function to step in and operate the schools or the police or the health departments which belong to the people themselves.

Counties Should Join Forces

This fact is fully recognized by the committee, though it is not necessary that every county or townhip operate its own separate departments of public health. There is no good reason why counties and towns may not join to form health districts just as they join, now, to form school districts and jointly operate consolidated schools.

In fact, the Rockefeller Foundation, in its subsidized experiments in the South, found that the county is too small a unit to support a full-time county health unit and that, in all but large city-county districts, a larger unit is necessary and advisable for effectiveness and successful financing. Furthermore, even if county units were desirable, it would take a matter of 150 years, at the present rate of progress, to cover all of the 3,070 counties of the United States with full-time, organized health units.

$1.00 Per Capita Recommended

Accordingly, the committee, after extensive studies, decided that divisions should be based upon population, rather than governmental units. It was agreed that 50,000 was the smallest population group which could successfully support a health unit. The country as a whole was divided, then, into units of 50,000, and 1,127, instead of 3,070 health districts, have been proposed. For their support, it is recommended that $1.00, instead of the current 25 to 40 cents, be spent per capita on public health. Also, the typical health district unit should have ten public health nurses, one to each 5,000 persons, plus the usual laboratory and epidemiological staff and equipment, trained sanitary engineers and clerical assistance all under the direction of a full-time, trained medical officer of public health. Personnel would of course, be multiplied and varied, as at present, in large city health departments.

In Minnesota, at the present time, there are only four health districts. They are organized along the lines set up by the committee, but lack sufficient trained personnel and, in any case, cover only a fraction of the state. The largest part of the state is without such protection except for the services of part-time health officers often unpaid or underpaid. Part-time service of health officers whose primary interests lie elsewhere is ineffective in the opinion of the committee.

The plan has been submitted to health departments in each of the forty-eight states and has already been approved by forty-four of them. The Minnesota State Board of Health has studied it carefully and is of the opinion that ten health districts are all that are necessary here. It is probable, therefore, that ten units will be the goal, as a starter, at least in Minnesota.

In any case, it would seem to be a matter of simple common sense that any plan for improving the people's health should start with plans for improving the sanitary conditions in which they live, for controlling communicable disease, for improving milk and water supplies and for teaching the principles of health living. Compulsory sickness insurance plans take little account of such things. But they are the acknowledged, well-tested functions of a public health department and they are either nonexistent or spread far too thin in many sections of the country. Starting out with elaborate and costly provisions for taking care of people after they are sick would certainly seem to be a fine example of putting the cart before the horse. When, in so doing, the domain of individual responsibility is invaded and a good working system for caring for the sick is endangered, then failure of both cart and horse to arrive at any satisfactory destination is practically guaranteed.

It has been demonstrated over many years of experience in Minnesota that there is no conflict between a forward-looking, progressive state health administration and the private practice of medicine. Practicing physicians and public health officials work together here as a team for the public welfare and neither group encroaches on the special fields of the other. Certainly physicians in Minnesota will work wholeheartedly for the early extension of public health services in Minnesota.

MINNESOTA STATE BOARD OF MEDICAL EXAMINERS

Julian F. DuBois, M.D., Secretary

Minneapolis Osteopath Ends Life While on Trial for Manslaughter

Re State of Minnesota vs. James O. Humbert

James O. Humbert, sixty-four years of age, a licensed osteopath with offices at 200 Fifth Street, S. E., Minneapolis, was found dead in a room at a Minneapolis Hotel on May 7, 1944. Humbert, who was on trial in the District Court of Hennepin County on an indictment charging him with the crime of manslaughter in the first degree, was found with an artery slashed in his left wrist. Dr. Russell R. Heim, Coroner of Hennepin County, listed the death as a suicide.

Following a joint investigation made by Detectives Eugene Bernath and Eugene Dougherty of the Minneapolis Police Department, and a representative of the Minnesota State Board of Medical Examiners into the circumstances surrounding the death on March 26, 1944, of a twenty-three-year-old unmarried Dakota County farm girl, Humbert was indicted by the Grand Jury of Hennepin County on April 3, 1944, for causing the death of the girl following a criminal abortion. Prior to her death the girl named Humbert as the person who had performed the operation upon her for $150. Humbert, who was taken into custody the evening of March 25, was found unconscious in his jail cell on the morning of March 26, from a self-administered opiate and was removed to Minneapolis General Hospital in a critical condition. He subsequently recovered and his trial commenced on April 28. In addition to the witnesses who testified concerning the case for which the defendant was on trial, the State also called three witnesses who testified that the defendant had performed a similar operation on a seventeen-year-old Dakota County farm girl for a like fee of $150 on February 14, 1944. The State completed its case on May 5, and the Court recessed until Monday, May 8. On Saturday afternoon, May 6, the defendant registered at a Minneapolis loop hotel, under the name of J. H. Wilson, Omaha, Nebraska. He was found dead in the room the next afternoon.

The trial was before the Hon. Levi M. Hall, Judge of the District Court, and was conducted for the State by Mr. Michael J. Dillon, County Attorney of Hennepin County, and his assistant, Mr. Luther Sletten. Judge Hall, upon being informed of the defendant's death, granted Mr. Dillon's motion to dismiss the case.

Minneapolis Ash Hauler Pleads Guilty to Abortion

Re State of Minnesota vs. Alvin H. Mesalk

On April 18, 1944, Alvin H. Mesalk, forty-five years of age, 224 Fremont Avenue North, Minneapolis, entered a plea of guilty in the District Court of Hennepin County, to an indictment charging him with the crime of abortion. Following a lengthy investigation by the Probation Officer of Hennepin County, Mesalk was sentenced on April 29, 1944, by the Hon. Levi M. Hall, Judge of the District Court, to a term of not to exceed two years in a State penal institution, the sentence being suspended and the defendant placed on probation for an equal length of time.

Mesalk was arrested on March 29, 1944, by Hennepin County Deputy Sheriffs Ed Antletz and Stanley Hurley, following a report to the State Board of Medical Examiners by a Minneapolis Hospital that a patient had been brought in that day suffering from the aftereffects of what apparently was a criminal abortion. The facts disclosed that Mesalk had attempted to perform an abortion with a catheter on a twenty-five-year-old married woman at her home in rural Hennepin County, on March 24, 1944. Mesalk, a rubbish and ash hauler, had met the woman in a Washington Avenue bar. Mesalk stated to the Court that he was born at Edgar, Wisconsin, in 1898, and had numerous convictions for vagrancy, petit larcency, assault and battery and other minor offenses. He also stated to Judge Hall that this was his first and last attempt at doing an abortion. Judge Hall, before imposing sentence, strongly criticised the defendant and told him that unless he abided by the terms of his probation, he would have to serve his two-year sentence.

South Saint Paul Osteopath Pleads Guilty to Criminal Abortion

Re State of Minnesota vs. Paul A. Reilly

On May 20, 1944, Paul A. Reilly, forty-nine, entered a plea of guilty in the District Court at Hastings, Minnesota, to an information charging him with the crime of abortion. Reilly, a licensed osteopath with offices in the Schult Building, South Saint Paul, surrendered in open court his Minnesota Basic Science certificate and his osteopathic license for cancellation. Upon the surrender of those instruments and upon the recommendation of Mr. Vance B. Grannis, County Attorney of Dakota County, and Mr. Brist, attorney for the Minnesota State Board of Medical Examiners, Judge Schultz passed the matter until the next regular term of court at Hastings, the defendant being permitted to remain at liberty on $1,000 bail.

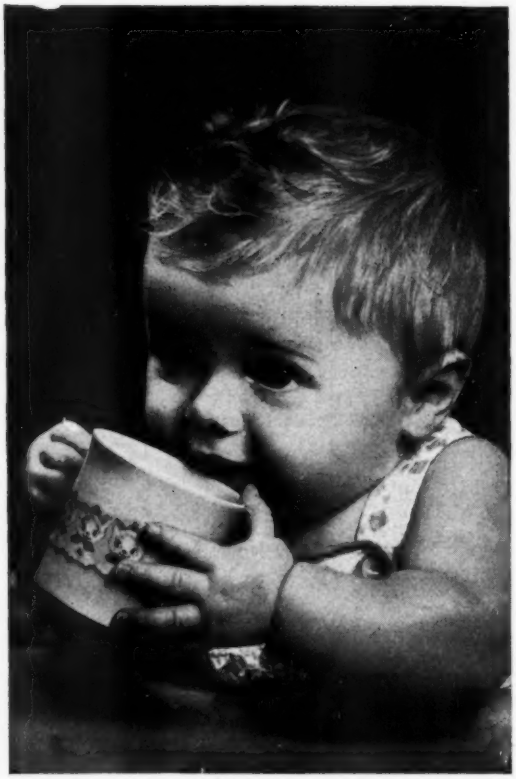
Reilly admitted having performed a criminal abortion on a married woman from Saint Paul on or about March 23, 1944. Prior to the defendant's arrest, he signed a statement admitting that he had performed approximately fifteen similar abortions in the past three years. Reilly was paid $35.00 for his services in the case in which he was prosecuted. The abortion was performed by packing the uterus with gauze. The patient subsequently became ill and was removed to Ancker Hospital in Saint Paul, where she recovered.

License of Saint Paul Physician Revoked

Re The Matter of the Revocation of the License of John Henry Spearing, Jr., M.D.

Dr. John Henry Spearing, Jr., thirty-two years of age, 809 Cleveland Avenue, South, St. Paul, had his license to practice medicine revoked by the Minnesota State Board of Medical Examiners on May 12, 1944. Dr. Spearing was sentenced to a term of 180 days in the Minneapolis Workhouse on March 15, 1944, following his plea of guilty to a charge of careless driving and driving without a driver's license in his possession. Dr. Spearing was licensed in iMnnesota July 10, 1942, on the basis of reciprocity with Wisconsin. Before his license was issued Dr. Spearing was warned by the Minnesota State Board of Medical Examiners that his license was being issued notwithstanding numerous convictions at Milwaukee, Wisconsin, for drunkenness, drunken driving, reckless driving and disorderly conduct, after Dr. Spearing had assured the Medical Board that he full yappreciated his responsibilities as a physician, particularly during the war emergency.

Dr. Spearing was born in Chicago, Illinois, in 1912, and received his Doctor of Medicine Degree from the University of Chicago in 1938.



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In Memoriam

CHARLES E. CAINE

Dr. Charles E. Caine of Morris, Minnesota, passed away April 15, 1944, in his seventy-sixth year. He was the owner of the Morris hospital, had been mayor of Morris since Jannuary, 1942, and for six years previous had been a member of the City Commission.

Doctor Caine was born on a farm at Spring Brook, near Princeton, Minnesota, May 25, 1868. After teaching school a few years, he entered the medical college at the University of Minnesota, graduating in 1896. The same year, he began practice at Elbow Lake. His marriage to May Martin at Sauk Rapids took place December 31, 1896.

In 1899, Doctor Caine went to Morris, where he had since practiced continuously. His years of practice date back to the days when county practice was a test of endurance and hardihood.

Doctor Caine had held numerous positions of responsibility during his many years of practice, having served as city and county physician, as county coroner for sixteen years, and as member and president of the Morris Board of Education. He also had been surgeon at Morris for both the Great Northern and Northern Pacific railways.

Doctor Caine served for a number of years on the State Board of Medical Examiners and was president of the board for a time. He was a charter member of the West Central Minnesota Medical Society and was a member of the Minnesota State and American Medical Associations. He was also a Mason, a member of the Bethel Commandery Number 19, Knights Templar, and of the Fraternal Order of Eagles.

Doctor Caine was preceded in death by his son, John, and by his wife in 1930. His daughter, Mrs. Lois McElligott, survives him.

SHORTAGE OF DOCTORS FOR CIVILIAN PRACTICE

The recent action of the Army restricting the specialized training program to medical students now enrolled in approved medical schools and discontinuing the accelerated premedical courses will seriously jeopardize the total supply of qualified physicians for all purposes. At the present time 20 per cent of all medical students, women or men, physically disqualified for military service, constitute the only source of physicians for civilian practice. Under the accelerated training program this amounts to about 1,500 medical graduates each year. As fully 3,500 physicians are removed from civil practice each year by retirement or through illness and death, an accumulating deficit of physicians for civilian practice of approximately 2,000 physicians is developing annually.

A continuing shortage of doctors for civilian practice is threatened and unfortunately a solution of the problem is not in sight.—*Federation Bulletin*, May 1944.

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REPORTS and ANNOUNCEMENTS

AMERICAN CONGRESS OF PHYSICAL THERAPY

The American Congress of Physical Therapy will hold its twenty-third annual scientific and clinical session September 6, 7, 8 and 9, 1944, inclusive, at the Hotel Statler, Cleveland, Ohio. Rehabilitation is in the spotlight today—physical therapy plays an important part in this work. The annual instruction course will be held from 8:00 to 10:30 a.m., and from 1:00 to 2:00 p.m. during the days of September 6, 7 and 8. The scientific and clinical sessions will be given on the remaining portions of these days and evenings. All of these sessions will be open to the members of the regular medical profession and their qualified aids. For information concerning the instruction course and program of the convention proper, address the American Congress of Physical Therapy, 30 North Michigan Avenue, Chicago 2, Illinois.

WASHINGTON COUNTY SOCIETY

The regular monthly meeting of the Washington County Medical Society was held Tuesday, April 11. Final reports on full-page advertisements in the *Stillwater Daily* and *Weekly Gazette* and in the *Forest Lake Times* in opposition to the Wagner-Murray-Dingell legislation now before Congress were made and accepted. This activity was sponsored by the Washington County Medical Society, dentists and druggists in the county, nurses' club, and Lakeview Memorial Hospital. Copies of these papers were sent to our representatives in Congress, state representatives, and others. James J. Swendson, M.D., of Saint Paul, addressed the meeting on "Indications for Surgical Operations in Obstetrics" very instructingly.

The regular May meeting became a social one for the doctors and their wives. The guest speaker, William A. O'Brien, M.D., Professor of Postgraduate Medicine at the University of Minnesota, presented, in his usual happy, forceful and distinguished manner, the great advancements made in medicine during the past fifty or sixty years He paid tribute to the completion of fifty years in the practice of medicine by Dr. E. Sidney Boleyn, secretary of the Washington County Society, whose activities in the interest of medicine during that period were commented upon with praise. The Society presented Dr. Boleyn with a gift in honor of his years of medical practice.

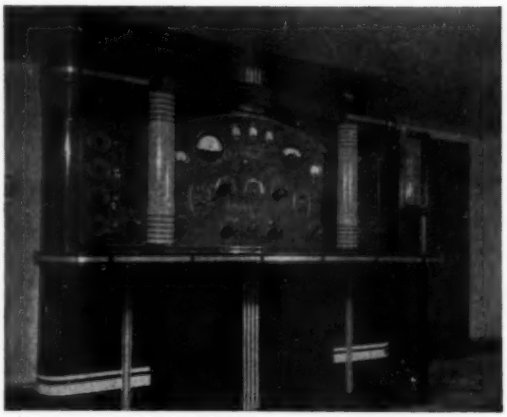
WEST CENTRAL SOCIETY

The West Central Medical Society met in May at the club house of the Morris Golf Club. Golf in the afternoon preceded the chicken dinner served at 7 p.m.

Dr. B. J. Branton of Willmar, speaker of the evening, talked on postwar medical problems. A discussion followed and different opinions went on record for future reference.

Dr. Vincent Ryding of Starbuck was elected a member of the society. Dr. C. E. Caine of Morris, a charter member, passed away on April 15.

Radiation Therapy Institute



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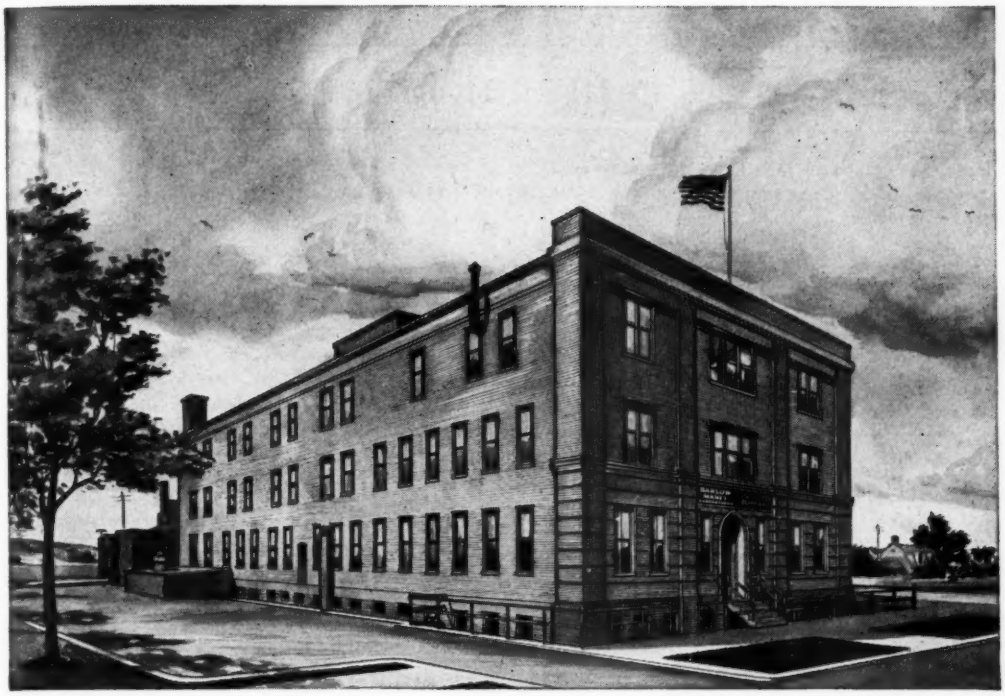

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Of General Interest

Dr. Leo McMahon of Breckenridge has reported for duty in the U. S. Navy with the commission of Lieutenant Commander.

* * *

Dr. G. H. Mesker of Olivia is now located at Camp Savage, having entered Army service as a Lieutenant in the Medical Corps.

* * *

Dr. J. A. Malerich, for many years supervisor at the General Hospital in Shakopee, has moved to West Saint Paul, with offices at 950 South Robert Street.

* * *

Dr. J. W. Stuhr of Stillwater was among those who took the continuation course in surgery at the University of Minnesota in May.

* * *

Dr. Charles M. Bagley of Duluth, who is in the U. S. Navy, was recently promoted from Lieutenant (sg) to Lieutenant Commander. His wife and son are living at Norfolk, Virginia, at present.

* * *

Dr. Oliver W. Roberts of Owatonna reported for duty in the Medical Corps of the U. S. Navy in May. He has the commission of surgeon with the rank of Lieutenant Commander.

Dr. Oscar E. Enroth has moved his office from White Bear, Minnesota, to Saint Paul. His new location is at 823 East Seventh Street at the corner of Arcade and Seventh.

* * *

Dr. C. L. Sherman of Luverne was reappointed to the State Board of Medical Examiners in May by Governor Thye. Dr. Sherman has served on the Board for the past seventeen years.

* * *

Dr. Elmer E. Keithahn, who has been associated with Dr. George E. Sherwood in the practice of medicine at Litchfield, Minnesota, since 1939, has moved to Sleepy Eye, where he will establish a medical practice.

* * *

Dr. F. W. Behmler, who has been associated with the late Dr. C. E. Caine at Morris for the past eight years, will act as supervisor in continuing the Morris Hospital established by Dr. Caine in 1925.

* * *

Dr. John H. Remington, Fellow in Surgery, Mayo Foundation, has received the Paine Company Award of $100.00 from the Rochester Academy of Medicine for his paper on "Amino Acid Alimentation," which was presented at the meeting of the Academy on May 2.

(Continued on Page 506)

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Dr. Frederick A. Olson, formerly of Minneapolis, has announced the opening of his office in Suite 309 Wilshire Medical Building, 1930 Wilshire Boulevard, Los Angeles 5, California, for the praticc of surgery and surgical diagnosis.

* * *

Dr. Stanley B. Maxeiner of Minneapolis, addressed the staff of the U. S. Naval Hospital, Great Lakes, Illinois, on "Local Anesthesia," April 29. He also gave the address at the annual meeting of the Duluth Surgical Society on May 25. His subject was "Surgical Aspects of Peptic Ulcer."

* * *

Dr. E. Mendelssohn Jones of Saint Paul, president of the Minnesota State Medical Association, was guest speaker at a joint meeting of the Rotary and Lions Clubs of Stillwater on May 18, when he presented an analysis of the Wagner-Murray-Dingell Bill now before Congress. The meeting was open to the public.

* * *

Dr. Arnold O. Welch, research director of Sharp & Dohme Company, has taken Dr. T. H. Sollmanns' position as head of the department of pharmacology at the School of Medicine at Western Reserve University following the latter's retirement. Dr. Sollmann retains his position as chairman of the Council of Chemistry and Pharmacology of the AMA.

* * *

Dr. Robinson Bosworth, formerly of Saint Paul and executive secretary of the Minnesota Tuberculosis Sanatorium Commission from 1913 to 1925, was awarded the Dearholt medal for leadership in the tuberculosis sanatorium construction program in the nation at the annual meeting of the Mississippi Valley Conference on Tuberculosis, May 14, 1944. Dr. Bosworth was cited especially for his planning and development of the sanatorium system in Minnesota. He is at present superintendent of the Pleasant View Sanatorium in East Saint Louis, Illinois.

* * *

A plaque for the "best hospital public education program in the nation for 1942 and 1943" was presented to the Minnesota Hospital Association at the opening meeting of the three-day convention of the Association, May 14. The award was presented by Frank J. Walter of Denver, president of the American Hospital Association. Rev. L. B. Benson of Saint Paul, president of the Minnesota group, accepted the award in behalf of the Association.

Those elected to office for the coming year are: Thomas E. Broadie, M.D., Ancker Hospital, Saint Paul, president; Miss Dina Bremness, Glenwood Hospital, Glenwood, president-elect; Miss Frances Eckman, Miller Hospital, Duluth, first vice president; Sister Christopher, St. Cloud Hospital, St. Cloud, second vice president; Miss Nellie Gorgas, St. Barnabas Hospital, Minneapolis, treasurer (reëlected); A. F. Branton, M.D., Willmar, Executive Secretary (reëlected). Members of the Board of Directors are: J. H. Mitchell, Colonial Hospital, Rochester; Emil Hansen, St. Luke's Hospital, Fergus Falls; Sister Anna Bergeland, Lutheran Deaconess Hospital, Minneapolis; W. W. Sherman, Itasca County Hospital, Grand Rapids.

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MEDICINE—Two Weeks' Personal Course in Electrocardiography and Heart Disease, starting August 7. Two Weeks' Course in Internal Medicine, starting October 16.

GYNECOLOGY—Two Weeks' Intensive Course, starting October 2. One Week's Personal Course in Vaginal Approach to Pelvic Surgery, starting October 23.

OBSTETRICS—Two Weeks' Intensive Course, starting June 26.

ANESTHESIA—Two Weeks' Course in Regional, Intravenous and Caudal Anesthesia.

GASTROSCOPY—Personal Course, starting October 16.

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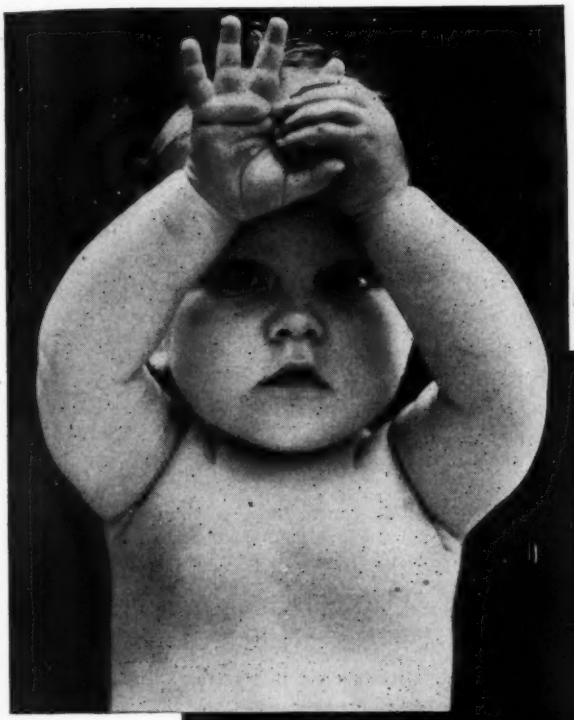

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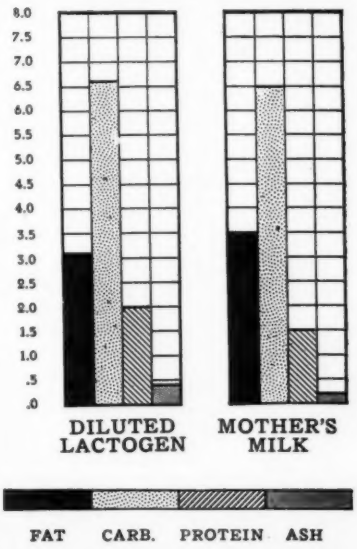

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Clinical Pediatrics, p. 156.

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BOOK REVIEWS

Books listed here become the property of the Ramsey, Hennepin and St. Louis County Medical libraries when reviewed. Members, however, are urged to write reviews of any or every recent book which may be of interest to physicians.

FUNDAMENTALS OF PSYCHIATRY. Second Edition. Edward A. Strecker, M.D., Sc.D., F.A.C.P. Professor of Psychiatry and Chairman of the Department, Undergraduate School of Medicine, University of Pennsylvania; Psychiatrist to the Pennsylvania Hospital; Attending Psychiatrist, Psychopathic Division, Philadelphia General Hospital; Consultant to the Bureau of Medicine and Surgery, United States Navy; Consultant to the Secretary of War, A.A.F. 219 pages. Illus. Price, $3.00, cloth. Philadelphia: J. B. Lippincott Co., 1943.

INDUSTRIAL OPHTHALMOLOGY. Hedwig S. Kuhn, M.D. 294 pp. $6.50. St. Louis: C. V. Mosby Co., 1944.

This work summarizes Dr. Kuhn's efforts in industrial ophthalmology. The author has analyzed the requirements for visual testing in industries pointing out the necessity of placing employes in their proper environment visually. Different requirements for visual tests are described and techniques are outlined. Stress is laid on the necessity for specific refractions for special jobs pointing out that a crane operator should be examined from a different viewpoint than a person doing close work from eight to ten inches.

The author uses the term "visual engineers" meaning that the ophthalmologist must acquaint himself with the employes' surroundings and visual requirements.

Dr. A. C. Snell has written a chapter on "Industrial Eye Injuries" and this is an excellent summary of this phase of ophthalmology.

There is a description of goggles and other requirements for eye protection. Discussion is introduced on the new phases of industrial ophthalmology particularly relating to welding. Mention is also made of the epidemics of keratoconjunctivitis. In the appendix are listed toxic hazards with the basic plans of treatments.

This book is very much worth while for anyone interested in industrial ophthalmology, as most of us are, to a greater or lesser degree. It opens a new field and brings out the many new requirements that are expected of the present-day oculist.

F. N. KNAPP, M.D.

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